

City of Swan
Workshops Avenue. Midland

Native Vegetation Clearing Permit – Purpose Permit
Supporting Documentation

9 February 2022

59422-132444 (Rev 0)

JBS&G Australia Pty Ltd T/A Strategen-JBS&G

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1. Introduction

City of Swan (City) propose to clear up to 1.2 hectares (ha) of native vegetation within a 1.904 ha development envelope to facilitate the construction of a road, “Workshops Avenue” (the ‘Project Area’). The remaining 0.71 ha of the total Project Area is comprised of cleared land.

1.1 Project background and description

It is proposed to construct Workshops Avenue to link Lloyd Street in the east (currently under construction) and Coppershop Road within the existing Midland Redevelopment Area. Workshops Avenue will comprise a single carriageway road with a shared path and associated drainage infrastructure (drainage basin, culverts, stormwater pipes).

The Project Area was originally 1.55 ha. Following a review of the project by the City, this was modified and now comprises an area of 1.904 ha. The area of native vegetation to be cleared is approximately 1.2 ha.

A larger area to the Project Area was surveyed by Strategen Environmental in 2016 consisting of approximately 13.85 ha.

A Clearing Permit is required as the Project Area is located within and adjacent to an Environmentally Sensitive Area (ESA). As a result there are no exemptions for the proposed clearing under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

1.2 Scope

This document provides supporting information for a Native Vegetation Clearing Permit (NVCP) application (purpose permit) to clear up to 1.2 ha of native vegetation within an area of 1.904 ha (the Project Area). The Project Area is located within the survey area of approximately 13.85 ha (Figure 1.1), located in the vicinity of Workshops Avenue within the City.

This document has been prepared to support the assessment under s.51E of the *Environmental Protection Act 1986* (EP Act), and includes the following information relating to clearing impacts:

- An overview of the existing environmental conditions of the application area
- An evaluation of the proposed clearing against the ‘10 Clearing Principles’ listed under Schedule 5 of the EP Act
- Environmental approvals and management requirements.

1.3 Ownership and tenure

Lots impacted by the application and their tenure are provided in Table 1.1.

Table 1.1: Site identification details

Lot No	Land ID	Survey Plan	Owner	Reserve #/Land ID
P Road	4337499	N/A	State of WA (Under City of Swan control)	
P Road	4293516	N/A	State of WA (Under City of Swan control)	
P Road	4293513	N/A	State of WA (Under City of Swan control)	
Lot 8025	4287508	DP408829	State of WA (MRA responsible agency)	R50152 - 4304656
Lot 791	4306928	DP411164	State of WA	
Lot 792	4306929	DP411164	MRA	
Lot 700	4113728	DP400757	State of WA	
Lot 505	4290658	DP408522	State of WA (MRA responsible agency)	R52642 - 4290658

1.4 Related applications





There are no related applications by the City of Swan.

Main Roads WA is currently progressing the construction of the Lloyd Street extension to the south which includes a crossing (bridge) of the Helena River. This work is located immediately to the east of the Project Area.

1.5 Stakeholder consultation

The Rivers and Estuaries (R&E) branch of the Department of Biodiversity, Conservation and Attractions (DBCA) is the agency responsible for the management of the Swan and Canning Rivers. Staff from R&E have been briefed (dated 20 October 2020) and provided with planning documentation in relation to the proposed works. Advice provided by R&E at the meeting and through subsequent discussions has been used to inform this assessment and NVCP application.



Legend  Application area  Cadastral boundary  Roads (MRWA)	Scale 1:3,500 at A4 0 25 50 metres Coord. Sys. GDA 1994 MGA Zone 50 Job No: 59422 Client: City of Swan Version: A Drawn By: cthatcher	Workshop Avenue City of Swan APPLICATION AREA FIGURE 1.1 
	Date: 05-May-2022 Checked By: RD	

2. Existing environment

2.1 Climate

The Midland locality experiences a Mediterranean climate characterised by mild, wet winters and warm to hot, dry summers. The nearest Bureau of Meteorology (BoM) weather station at Perth Airport (Station No. 9021), approximately 5 km south of the Project Area, provides average monthly climate statistics for the Midland locality (Figure 2.1). Average annual rainfall recorded at Perth Airport since 1944 is 762.1 mm (BoM 2020). Rainfall may occur at any time of year; however, most occurs in winter in association with cold fronts from the southwest. Highest temperatures occur between December and March, with average monthly maximums ranging from 29°C in December to 32°C in February (BoM 2016). Lowest temperatures occur between June and September, with average monthly minimums ranging from 8°C in July to 9°C in June (BoM 2020).

Summary climate data for the Perth Airport meteorological station is presented in Figure 2.1.

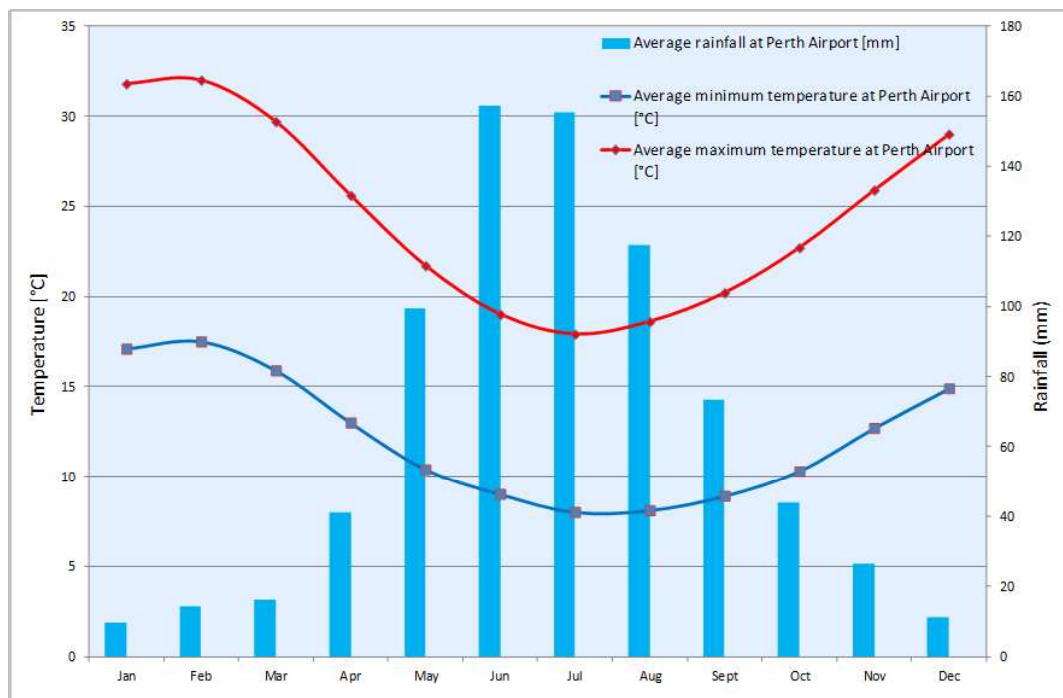


Figure 2.1: Climate data for Perth Airport - 09021 (nearest meteorological station) (Source: Bureau of Meteorology 2020)

2.2 Landform and topography

Ground elevations vary from approximately 10 m to Australian height Datum (AHD) at the western end of the project to 15 m AHD at the eastern end (Figure 2.2).

The Project Area is located within and immediately adjacent to the Helena River floodplain (refer to Section 2.4).

Local modifications to topography have occurred and are occurring as a result of construction of the current infrastructure for the Midland Central commercial area and Lloyd Street extension.



<div>Legend</div> <div><div></div> Application area</div> <div><div></div> Topographic contours (mAHD)</div> <div><div></div> Watercourse</div> <div><div></div> Roads (MRWA)</div>	Scale 1:3,500 at A4 <div><div>02550</div><div>metres</div></div>		<div>Workshop Avenue</div> <div>City of Swan</div> <div>TOPOGRAPHY</div>
	Coord. Sys. GDA 1994 MGA Zone 50 <div><div></div></div>		
	Job No: 59422		
	Client: City of Swan		
	Version: A <div>Date: 10-May-2022</div>		<div>FIGURE 2.2</div> <div><div><div></div></div><div>strategen</div><div>JBS&G</div></div>
	Drawn By: cthatcher <div>Checked By: RD</div>		

2.3 Soils

The Project Area is located within the Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion) of Western Australia (Mitchell et al. 2002) (refer Figure 2.3). The Swan Coastal Plain comprises five major geomorphologic systems that lie parallel to the coast, namely (from west to east) the Quindalup Dunes, Spearwood Dunes, Bassendean Dunes, Pinjarra Plain and Ridge Hill Shelf (Churchward & McArthur 1980; Gibson *et al.* 1994). Each major system is composed of further subdivisions in the form of detailed geomorphologic units (Churchward & McArthur 1980; Semeniuk 1990; Gibson *et al.* 1994). Beard (1990) describes the Swan Coastal Plain as a low-lying coastal plain, often swampy, with sandhills also containing dissected country rising to the duricrusted Dandaragan plateau on Mesozoic, mainly sandy, yellow soils. The project is located within the Pinjarra system which is described as:

- Swan Coastal Plain from Perth to Capel. Poorly drained coastal plain with variable alluvial and aeolian soils. Variable vegetation includes jarrah, marri, wandoo, paperbark sheoaks and rudis DPIRD (2018).

The Project Area is within the Mw31 soil system which is described by CSIRO as:

- Deeply incised, steep scarp and valley side slopes of the Darling scarp and its more deeply incised tributary valleys: chief soils of the steep scarp and valley side slopes, on which massive rock outcrops are a feature, seem to be acid red earths (Gn2.14) on the colluvial slope deposits. Associated are (Dr2.21) and (Dy3.21) soils on moderate to steep upper slopes with some (Uc4.11) soils containing ironstone gravel on spurs and ridge tops (CSIRO, 1991).

2.3.1 Contamination and acid sulfate soils

The site is currently classified under the *Contaminated Sites Act* (2003) as remediated for restricted use (RRU). There is a history of contamination within the proposed footprint and adjacent areas to the north as a result of historical activities associated with the Midland railway workshops. The Western Paddock area of the Project Area currently contains a stockpile of fill material from other areas within the Midland Workshops area known to contain contamination, including heavy metals and asbestos. The easement adjacent to the Western Paddock is also known to contain contaminated soils. Studies by ENV (2004, quoted in EMRC undated) identified elevated levels of pesticides at one location in the foreshore in the vicinity of the proposed footprint.

The proposed footprint is located in an area with a low to moderate risk of acid sulfate soils (ASS) occurring within 3 m of the soil surface (Figure 2.4). These ASS are related to the alluvial clay deposits associated with the Helena River (Figure 2.5).

An assessment (DSI) and ASS investigation completed by Strategen-JBS&G (2020) determined:

- Small areas of stockpiled soils immediately to the south of the Western Paddock contain asbestos fragments. No other areas were observed through test pitting and sampling to have any asbestos
- Very low concentrations of hydrocarbon were detected in two soil samples
- Metal concentrations within the soils were below thresholds for both human health criteria and ecological levels for environmentally sensitive areas (ESA)
- ASS risk is low to moderate with samples showing potential ASS. Further SPOCAS testing is recommended to confirm liming requirements should excavation of in situ soils be required during construction.

2.4 Groundwater and surface water

2.4.1 Surface water

The proposed footprint is located approximately 100 m from the Helena River (Figure 2.5). The Helena River is an ephemeral waterway and associated with a conservation category wetland (CCW). The Project Area is located 19m from the CCW. The flood water level is estimated to vary from 7.26-8.20 m Australian Height Datum (AHD) along the reach nearest the proposed footprint. The proposed footprint is partially within the 50 m buffer of the CCW.

Two small drains run through the proposed footprint, providing flow paths for stormwater from urban areas to the north to enter the Helena River.

2.4.2 Groundwater

Superficial groundwater in the Midland Redevelopment Area is known to include a Shallow Superficial Aquifer (SSA) and a deeper Lower Superficial Aquifer (LSA). These are separated by a 4-6 m thick layer of clay and sandy clay strata (Strategen 2017). The SSA is more important from an urban water perspective as this aquifer interacts with the Helena River. Groundwater in the SSA in the Midland workshops area flows in a south-easterly direction towards Helena River (Figure 2.6). A further round of groundwater monitoring is proposed.

2.4.3 Water quality



Groundwater and surface water monitoring was undertaken across the Project Area by Strategen in August 2016 (Strategen 2017). Water quality exceeded Swan Canning Water Quality Improvement Plan (SCWQIP) short term criteria for total nitrogen at four locations. SQWIP short term criteria for total phosphorus were exceeded at six locations. Exceedances of these guidelines are common in urban and agricultural areas.



Legend

 Application area

Surface geology

-  Cm2
CLAY - dark strong brown, hard when dry, soft when moist, variable silt content, no sand, of alluvial origin
-  Mgs1
PEBBLY SILT - strong brown silt with common, fine to occasionally coarse-grained, sub-rounded laterite quartz, heavily weathered granite pebble, some fine to medium-grained quartz sand, of alluvial origin

Scale 1:3,500 at A4

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 50



Job No: 59422

Client: City of Swan

Version: A

Date: 11-May-2022

Drawn By: cthatcher

Checked By: RD

Workshop Avenue
City of Swan

SOILS

FIGURE 2.3

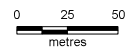




Legend

- Application area
- Acid sulfate soil (DWER)
- Moderate to low risk

Scale 1:3,500 at A4



Coord. Sys. GDA 1994 MGA Zone 50



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**Workshop Avenue
City of Swan**

ACID SULFATE SOILS

FIGURE 2.4





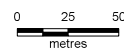
Legend <div><div></div> Application area</div> Geomorphic Wetlands <div><div></div> Conservation</div> <div><div></div> Multiple use</div> <div><div></div> Watercourse</div>	Scale 1:3,500 at A4 <div><div>02550</div><div>metres</div></div>		Workshop Avenue City of Swan	
	Coord. Sys. GDA 1994 MGA Zone 50 <div><div></div></div>			SURFACE WATER AND WETLANDS
	Job No: 59422			
	Client: City of Swan			
	Version: A		Date: 10-May-2022	FIGURE 2.5
	Drawn By: cthatcher		Checked By: RD	



Legend

- Application area
- Groundwater contours - minimum (mAHD)

Scale 1:3,500 at A4



Coord. Sys. GDA 1994 MGA Zone 50



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**Workshop Avenue
City of Swan**

GROUNDWATER

FIGURE 2.6



2.5 Vegetation and flora

A Level 1 flora and vegetation survey of the Project Area was undertaken by Strategen in 2015. In February 2022, an Ecologist and assistant Ecologist from Strategen JBS&G undertook a vegetation condition and vegetation type assessment to confirm the environmental values from previous surveys. The 2022 assessment confirmed the findings of the 2016 survey as presented in the following sections.

2.5.1 Regional Vegetation

Vegetation occurring within the region was initially mapped at a broad scale (1:1 000 000) by Beard during the 1970s. This dataset has formed the basis of several regional mapping systems, including physiographic regions defined by Beard (1981) which led to the delineation of botanical districts as described in Beard (1990); the biogeographical region dataset (Interim Biogeographic Regionalisation for Australia, IBRA) for Western Australia (DEE 2016a) and vegetation association mapping as defined in Government of Western Australia (2016).

2.5.1.1 Beard (1990) Botanical Subdistrict

The Project Area occurs within the Drummond Botanical Subdistrict which is characterised by low *Banksia* woodlands on leached sands; *Melaleuca* swamps on poorly-drained depressions; and *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri) woodlands on less leached soils (Beard 1990) and the Swan Coastal Plain 2 IBRA subregion. The native vegetation observed with Project Area is characteristic of the Swan and Guildford vegetation complexes and the Pinjarra 1009 vegetation system, described as: Medium woodland; marri & river gum (GoWA 2019a).

Currently, 16.40% remains of the 18,184.82 ha pre-1750 extent of the Pinjarra 1009 vegetation system within the Swan Coastal Plain IBRA region and Swan Coastal Plain 2 IBRA subregion. Regarding the mapped vegetation complexes, 13.57% remains of pre-1750 extent of the Swan Complex while only 5.09% of the Guildford Complex persists. 0.89 ha of vegetation consistent with the Guildford Complex will be impacted for the project, reducing the remaining regional extent of the Guildford Complex by 0.02% and the remaining local extent (10km) by 0.30%.

2.5.1.2 IBRA subregion

IBRA describes a system of 85 'biogeographic regions' (bioregions) and 403 subregions covering the entirety of the Australian continent (Thackway & Cresswell 1995). Bioregions are defined based on climate, geology, landforms, vegetation and fauna.

The Project Area occurs within the Swan Coastal Plain 2 IBRA subregion which is dominated by *Banksia* or Tuart on sandy soils, *Casuarina obesa* on outwash plains and paperbark (*Melaleuca*) in swampy areas (Mitchell et al. 2002).

2.5.1.3 System 6 and vegetation system association mapping

System 6 mapping refers to vegetation mapping undertaken at a Vegetation Complex scale by Hedde *et al.* (1980). This is the primary source of information used to calculate potential impacts of proposals to clear native vegetation on the Swan Coastal Plain. The Project Area occurs within the Guildford and Swan complexes (Figure 2.7) which are described as:

- Guildford: A mixture of open forest to tall open forest of *Corymbia calophylla*-*Eucalyptus wandoo*-*E. marginata* and woodland of *E. wandoo* (with rare occurrences of *E. lane-poolei*). Minor components include *E. rudis*-*Melaleuca raphiophylla*
- Swan: Fringing woodland of *E. rudis*-*M. raphiophylla* with localised occurrence of low open forest of *Casuarina obesa*-*M. cuticularis*.

Vegetation system association mapping is also used to calculate potential impacts of proposals to clear native vegetation on the Swan Coastal Plain. The current and pre-European extent of these associations is published annually by Parks and Wildlife branch of DBCA.

2.5.1.4 Bush Forever

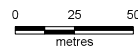
The nearest Bush Forever site (Talbot Road Bushland) is approximately 3.7 km north-east from the Project Area. The Project Area itself is not a Bush Forever site.



Legend

- Application area
- Pre-European vegetation (DPIRD)
 - Bassendean 1001
 - Pinjarra 1009
- Vegetation complexes (DBCA)
 - Guildford Complex
 - Swan Complex

Scale 1:3,000 at A4



Coord. Sys. GDA 1994 MGA Zone 50



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**Workshop Avenue
City of Swan**

REGIONAL VEGETATION

FIGURE 2.7



2.5.2 Project Area flora and vegetation

2.5.2.1 Native flora

A total of six native vascular plant taxa from five plant genera and five plant families were recorded within the Project Area (Strategen 2016). The relatively low number of species recorded, and lack of annual species reflects the highly disturbed nature of the survey area.

2.5.2.2 Threatened and Priority flora

No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Biodiversity Conservation Act (BC Act) and as listed by Parks and Wildlife (2015b) were recorded within the survey area. Additionally, no Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the survey area.

It should be noted that due to the time of survey (i.e. outside of the prime flowering period for species in the south-west of Western Australia), a full targeted Threatened and Priority flora survey was not undertaken of the Project Area. However, given the extremely degraded nature of vegetation within the area surveyed, no conservation significant species are likely to occur.

2.5.2.3 Introduced (exotic) taxa

A total of 14 introduced (exotic) taxa were recorded within the Project Area (Strategen 2016).

Two of these species (**Gomphocarpus fruticosus* [Narrow leaf Cottonbush] and **Solanum linnaeanum* [Apple of Sodom]) are Declared Plant species in Western Australia pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) according to the Western Australian Department of Agriculture and Food (DPIRD 2020). Narrow leaf Cottonbush was observed in high densities at multiple locations within the survey area and Apple of Sodom was observed in only one location within the survey area (Table 2.1).

Table 2.1: Locations of Declared Plant species pursuant to section 22 of the BAM Act recorded within the survey area

Species	GPS location (GDA 2020)	
	Latitude	Longitude
<i>*Gomphocarpus fruticosus</i>	-31.8985	116.0079
	-31.8982	116.0074
	-31.8979	116.0065
	-31.8973	116.0087
	-31.8974	116.009
	-31.8979	116.0095
	-31.8983	116.0091
	-31.8977	116.0085
	-31.8975	116.0086
<i>*Solanum linnaeanum</i>	-31.9	116.0086

2.5.3 Vegetation communities and types

Two vegetation types (VTs) were defined and mapped within the survey area (Strategen 2016) and are summarised in Table 2.2. Total areas occupied within the survey area and Project Area by each of the identified VTs are set out in Table 2.3.

Table 2.2: Vegetation Types

Vegetation Type	Description
1	<i>Eucalyptus rudis</i> and <i>*Ficus carica</i> woodland over <i>*Ricinus communis</i> tall shrubland over <i>*Typha orientalis</i> sedgeland or <i>*Ehrharta calycina</i> and Poaceae sp. open bunch grassland over <i>*Oxalis pes-caprae</i> low herbland on sandy, clay-loam soils.
2	<i>*Ehrharta calycina</i> and <i>*Cenchrus setaceus</i> open bunch grassland over <i>*Oxalis pes-caprae</i> herbland with scattered native and exotic trees and shrubs.
C	Cleared areas.

Vegetation type coverage

The total area mapped within the survey area and in relation to the project was 13.65 ha which includes fully cleared areas (Table 2.3, Figure 2.8). The dominant native VT within the survey area was VT 1 which can be broadly described as; *Eucalyptus rudis* and **Ficus carica* woodland over mixed weeds.

Table 2.3: Area (ha) covered by each VT within the Survey Area and Project Area

VT	Survey Area (ha)	Percentage of the Survey Area	Project Area (ha)	Percentage of the Project Area
1	7.35	53.85	1.13	59.28
2	2.23	16.34	0.07	3.68
C	4.07	29.82	0.71	37.04
TOTAL	13.65	100.00	1.90	100

2.5.4 Vegetation condition

The survey area shows signs of having been degraded for a long period of time. Historical land uses within the survey area and neighbouring properties are likely to have contributed to the level of weed infestation within the survey area and modification to vegetation structure in areas. Consequently, vegetation condition within the entire survey area (i.e. 13.65 ha) was rated as Completely Degraded (Keighery, 1994, Figure 1.1; Table 2.4).

Table 2.4: Vegetation condition scale (Keighery, 1994)

Condition rating	Description
Pristine (1)	Pristine or nearly so, no obvious sign of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by obvious signs of multiple disturbances. 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, grazing.
Degraded (5)	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 (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.



Legend

 Application area

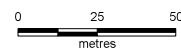
Vegetation type

VT1

VT2

Cleared

Scale 1:2,250 at A4



Coord. Sys. GDA 1994 MGA Zone 50



Job No: 59422

Client: City of Swan

Version: A

Drawn By: cthatcher

Date: 10-May-2022

Checked By: RD

**Workshop Avenue
City of Swan**

VEGETATION TYPE

FIGURE 2.8

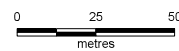




Legend

- Application area
- Vegetation condition
- Completely degraded

Scale 1:2,250 at A4



Coord. Sys. GDA 1994 MGA Zone 50



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Date: 10-May-2022

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**Workshop Avenue
City of Swan**

VEGETATION CONDITION

FIGURE 2.9



2.5.5 Threatened and Priority Ecological Communities

2.5.5.1 EPBC Threatened Ecological Communities

The Project Area is located within an area that may support the *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC) (Department of Energy and Environment (DoEE) 2016).

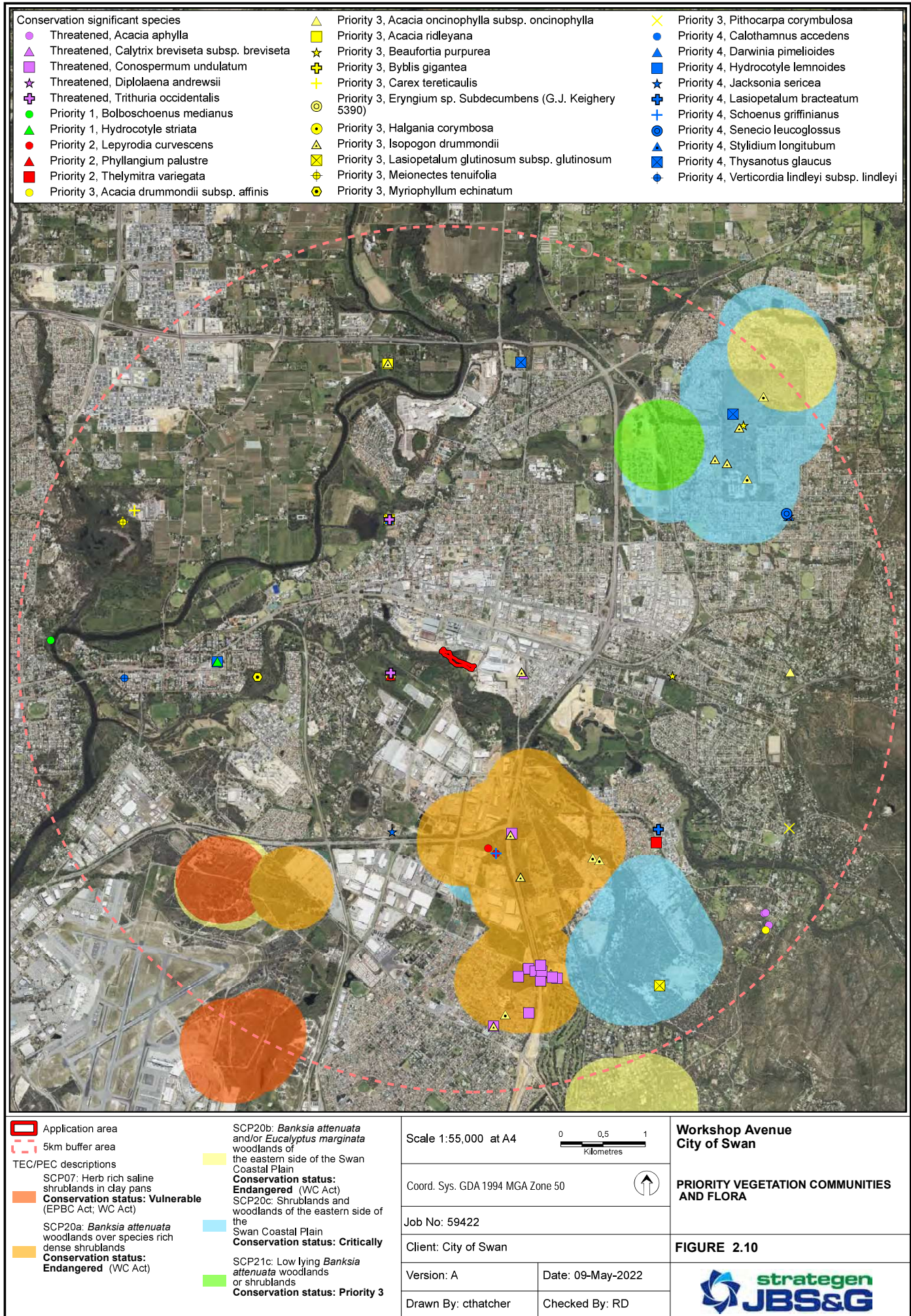
Vegetation within the Project Area and broader survey area were in completely degraded condition comprised of mature *Eucalyptus rudis* trees and no understorey (Strategen, 2016). The vegetation present in the application area did not contain any *Banksia* so cannot be considered to be a *Banksia* Woodland. It can therefore be concluded that the Commonwealth listed TEC does not occur within the Project Area.

2.5.5.2 EP Act and BC Act

The desktop assessment identified four TECs and one Priority Ecological Community (PEC) as occurring within 5 km of the survey area:

- SCP20c: Shrublands and woodland of the eastern side of the Swan Coastal Plain (TEC: Critically Endangered – EPBC Act)
- SCP07: Herb rich saline shrublands in clay pans (TEC: Critically Endangered – EPBC Act)
- SCP20a: *Banksia attenuata* woodland over species rich dense shrubs (TEC: Endangered – EPBC Act)
- SCP20b: *Banksia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain (TEC: Endangered – EPBC Act)
- SCP21c: Low lying *Banksia attenuata* woodlands or shrublands (PEC: P3).

Given the highly degraded nature of the survey area, direct comparison between the mapped VTs and known TEC and PECs is impossible. No *Banksia* species were recorded on site, no clay pans were recorded on site and there was no native shrub layer present. This therefore excludes the five conservation significant ecological communities listed above.



2.6 Environmentally Sensitive Areas

An Environmentally Sensitive Area (ESA) means an area declared in Regulation 6 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* to be an environmentally sensitive area. Areas declared to be ESAs for the purposes of Part V Division 2 of the EP Act includes:

- A declared World Heritage property as defined in section 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) of the Commonwealth
- An area that is registered on the Register of the National Estate, because of its natural values, under the *Australian Heritage Commission Act 1975* of the Commonwealth
- A defined wetland and the area within 50 m of the wetland
- The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located
- The area covered by a TEC
- A Bush Forever site listed in “Bush Forever” Volumes 1 and 2 (2000), published by the Western Australia Planning Commission, except to the extent to which the site may be cleared under a decision of the Western Australia Planning Commission (WAPC)
- The areas covered by the following policies:
 - The Environmental Protection (Gnangara Mound Crown Land) Policy 1992
 - The Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002
- The areas covered by the lakes to which the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 applies
- Protected wetlands as defined in the Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998
- Areas of fringing native vegetation in the policy area as defined in the Environmental Protection (Swan and Canning Rivers) Policy 1997
- These areas are protected under the Environmental Protection Act 1986 and are selected for their environmental values at a State or National level.

A search revealed the closest ESA is the Helena River which is associated with a CCW. Helena River is located approximately 100m from the Project Area (Figure 2.5).

2.7 Black cockatoo habitat

A Level 1 fauna assessment was undertaken by Strategen in 2015 and a Black Cockatoo nesting habitat assessment was completed by Strategen-JBS&G in 2020. The Project Area was also visited in February 2022 for a black cockatoo habitat tree assessment and to confirm the environmental values recorded by Strategen in 2015.

Eucalyptus rudis was the only habitat, foraging and roosting species identified on site. It is only utilised by Carnaby's Black Cockatoo and therefore, does not represent habitat for Baudin's Black Cockatoo (BBC) and Forest Red-tailed Black Cockatoo (FRTBC) (Strategen, 2016).

2.7.1 Carnaby's Black-Cockatoo

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) (CBC) is listed as Endangered under the Commonwealth EPBC Act and the State *Biodiversity Conservation Act 2016*. This species is endemic to the south-west of Western Australia, mainly occurring in uncleared remnant native eucalypt woodlands, especially those that contain Salmon gum and wandoo, and in shrubland or kwongan heathland dominated by *Hakea*, *Dryandra*, *Banksia* and *Grevillea* species (DSEWPac 2012).

The application area does contain trees that may be suitable for Carnaby's Black-Cockatoo nesting hollows in addition to a number of flora species that may be used as food sources.

Strategen (2016) undertook a habitat assessment in accordance with the EPBC Act Referral guidelines for three threatened black cockatoo species (DSEWPac 2012). The application area includes an area of approximately 1.2 ha of foraging habitat for Carnaby's Black-Cockatoo (Strategen 2016, Figure 2.12) that ranges in condition from Degraded to Poor.

No black cockatoos were sighted within the survey area during the assessment on 18 August 2016.

2.7.1.1 Foraging assessment

The survey area was divided into two different vegetation types, as outlined in Section 2.5.3. Both VTs contain flora species which are considered to be utilised by CBC for foraging; thus 9.58 ha of potential foraging habitat for CBC exists within the survey area (Groom 2011, Johnstone 2010a, Johnstone *et al.* 2011). No foraging habitat for FRTBC or BBC exists within the survey area.

Foraging habitat for black cockatoos is generally defined as the availability of plant food sources within an area (Finn 2012). Food availability for black-cockatoos is a function of the diversity, abundance, distribution, energetic and nutritional qualities, and seasonality (phenology) of the food sources within a particular area.

Table 2.5 summarises the value of each VT in terms of the quality of foraging habitat provided for black cockatoos. Table 2.6 provides a justification for how foraging values were defined.

Foraging habitat quality is displayed in Figure 2.11. Both VTs contained the same foraging species for CBC (*Eucalyptus rudis* and *Ficus carica*); however, the density of suitable foraging species was significantly higher in VT 1 than VT 2.

Based on the results of the foraging assessment, the survey area is considered to contain 7.35 ha of moderate-good quality foraging habitat and 2.23 ha of very-poor quality foraging habitat for CBC only. As such, foraging habitat within the Project Area comprises 1.13 ha of moderate-good quality and 0.07 ha of very-poor quality habitat.

No signs of black cockatoo foraging were observed in the survey area.

Table 2.5: Vegetation types and black cockatoo foraging species within the survey area

Vegetation type	Black cockatoo foraging species	Foraging quality	Area (ha)
1	<u>CBC</u> – <i>Eucalyptus rudis</i> . <u>FRTBC</u> – Nil. <u>BBC</u> – Nil.	<ul style="list-style-type: none"> Moderate - Good (CBC) Nil (FRTBC) Nil (FRTBC) 	7.35
2	<u>CBC</u> – <i>Eucalyptus rudis</i> . <u>FRTBC</u> – Nil. <u>BBC</u> – Nil.	<ul style="list-style-type: none"> Very poor (CBC) Nil (FRTBC) Nil (FRTBC) 	2.23

Table 2.6: Definition of black cockatoo foraging habitat within the survey area

Foraging quality	Justification
Excellent	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) and presence of food sources at several strata (i.e. canopy, midstorey and understorey).
Good	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) but food sources only present at one or two strata (i.e. canopy and midstorey).
Moderate	Moderate foraging value density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 20-40%) and food sources only present at one or two strata (i.e. canopy and midstorey).
Poor	Low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 10-20%) and presence of food sources at only one stratum (i.e. canopy).
Very poor	Very low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species <10%) and presence of food sources at only one stratum (i.e. canopy).
Nil	Cleared areas - no suitable vegetation present.

2.7.1.2 Significant tree assessment

Breeding habitat for black cockatoos is defined in Department of Sustainability, Environment, Water, Population and Communities (DSEWPac) (2012) as trees of species known to support breeding within the range of the species which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow (> 300 mm for salmon gum and wandoo, and >500 mm for other species). These trees are known as significant trees. Trees of this size may also be large enough to provide roosting habitat (i.e. trees which provide a roost or rest area for the birds). Significant trees which contain hollows that have an entrance diameter of more than 100 mm are suitable for use by black cockatoos (Whitford and Williams 2002). In general, hollows of sufficient size to support black-cockatoos do not form until trees are at least 230 years old, and the majority of nests are found in 300-500 year old trees (Johnstone 2006).

The only tree species potentially utilised by black cockatoos for roosting and/or breeding within the survey area is *Eucalyptus rudis*; which is only known to be used by CBC for these purposes. It therefore does not represent habitat for BBC and FRTBC (Johnstone *et al.* 2011). A total of 220 potentially significant *E. rudis* trees (with DBH >500 mm) were recorded in the survey area (Figure 2.11). All of these trees have the potential to be used as roosting habitat for CBC. Of these, 109 contained a hollow of sufficient size to be utilised by CBC for breeding purposes, however, given the location of these trees is outside of the known breeding range for CBC, it is highly unlikely that they provide breeding habitat for black cockatoos.

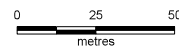
The significant tree assessment applies to roosting habitat for CBC only.



Legend

- Application area
- Black Cockatoo habitat
- Moderate-Good (CBC only)
- Very poor (CBC only)
- Nil

Scale 1:2,250 at A4



Coord. Sys. GDA 1994 MGA Zone 50



Job No: 59422

Client: City of Swan

Version: A

Drawn By: cthatcher

Date: 09-May-2022

Checked By: RD

**Workshop Avenue
City of Swan**

BLACK COCKATOO HABITAT

FIGURE 2.11

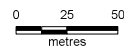




Legend

- Application area
- Carnabys Cockatoo Unconfirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-055)
- Carnabys Cockatoo Areas requiring investigation as feeding habitat in the Swan Coastal Plain (SCP) IBRA Region (DBCA-057)
- Carnabys Cockatoo Confirmed Roost Sites Buffered 6km (DBCA-052)

Scale 1:3,500 at A4



Coord. Sys. GDA 1994 MGA Zone 50



Job No: 59422

Client: City of Swan

Version: A

Drawn By: cthatcher

Date: 10-May-2022

Checked By: RD

**Workshop Avenue
City of Swan**

**POTENTIAL CARNABY'S
BLACK COCKATOO HABITAT**

FIGURE 2.12



2.7.2 Strategen 2020

A black cockatoo significant tree assessment of the Project Area was completed by Tony Kirkby on 3 September 2020. The assessment recorded 42 individual trees (*Eucalyptus rudis*) across the site all of which had a DBH greater than 500mm. The species is not a preferred food source for CBC and only provides seeds and nectar.

The assessment did not observe any hollows within these 42 individual trees that were suitable for use by CBC or evidence that CBC had used the hollows. Two trees had larger hollows which on closer examination were seen to be unsuitable for use by CBC as they were either too shallow or poorly shaped internally. Other trees had small hollows which were occupied by feral bees and small parrots (Australian Ringneck or Rainbow Lorikeet, both of which were observed in the area).

The findings of the 2020 assessment are presented in Appendix B.

2.7.3 Strategen JBS&G 2022 Survey

A site assessment of the Project Area was completed by an Ecologist and assistant Ecologist on 1 Feb 2022. The assessment recorded an additional five trees (*Eucalyptus rudis*) in the updated Project Area which had a DBH greater than 500mm. None of the recorded trees had hollows. Table 2.7 provides locations of the five trees. There were no roost sites evident, and no foraging or nesting evidence was observed.

Table 2.7: Location of significant trees recorded by Strategen JBS&G 2022

Tree species	Latitude	Longitude
<i>Eucalyptus rudis</i>	-31.89841266	116.0075654
<i>Eucalyptus rudis</i>	-31.89841585	116.0076409
<i>Eucalyptus rudis</i>	-31.89842615	116.0076433
<i>Eucalyptus rudis</i>	-31.8984958	116.0076545
<i>Eucalyptus rudis</i>	-31.89814269	116.0079399

The 2022 assessment confirmed the findings of the 2015 and 2020 surveys as presented in the sections above.

3. Assessment against the ten clearing principles

The following table presents an assessment against the ten clearing principles as set out in the EP Act.

Table 3.1: Assessment against ten clearing principles

Principle	Assessment	Conclusion
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity	<p>Clearing for the project is unlikely to be at variance to this principle.</p> <p>Native vegetation within the Project Area comprises two vegetation types (VT) totalling 1.2 ha. These VTs have been assessed as being Completely Degraded and may be described as:</p> <ul style="list-style-type: none"> VT1: <i>Eucalyptus rudis</i> and <i>*Ficus carica</i> woodland over <i>*Ricinus communis</i> tall shrubland over <i>*Typha orientalis</i> sedgeland or <i>*Ehrharta calycina</i> and Poaceae sp. open bunch grassland over <i>*Oxalis pes-caprae</i> low herbland on sandy, clay-loam soils; and VT2: <i>*Ehrharta calycina</i> and <i>*Cenchrus setaceus</i> open bunch grassland over <i>*Oxalis pes-caprae</i> herbland with scattered native and exotic trees and shrubs. <p>All native vegetation present across the Project Area (and larger survey area) is Completely Degraded. It exhibits a parkland cleared vegetation structure given the presence of a dominant overstorey species (<i>Eucalyptus rudis</i>) with a completely degraded understorey. Only six native plant taxa are present within the Project Area (Strategen 2016).</p> <p>No threatened or priority flora species or ecological communities were identified within the Project Area. These values are unlikely to be supported given the degraded nature of the vegetation present.</p> <p>Fauna species observed in the vicinity of the Project Area include Australian Ringneck parrots, Rainbow lorikeets, Splendid Wrens and CBC. Vegetation within the Project Area is considered likely to be habitat that may be suitable for foraging and roosting by CBC.</p> <p>Within the Project Area there is 1.2 ha of potential CBC foraging habitat, of which 94.2 % is moderate to good quality and 5.8% very poor quality habitat. There are 47 potentially suitable habitat trees. None of the habitat trees identified contained hollows suitable for CBC breeding (Kirkby 2020).</p> <p>Given the highly degraded nature of the vegetation present, low number of native vascular plant species, and the generally degraded nature of CBC foraging habitat, the Project Area is not considered to comprise a high level of biodiversity.</p>	Unlikely to be at variance.
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	<p>Clearing for the project is unlikely to be at variance to this principle.</p> <p>The Project Area is dominated by <i>Eucalyptus rudis</i> and may be described as parkland cleared due to the completely degraded nature of the understorey. The understorey is dominated by weed species, two of which are Declared Plant species in Western Australia (Strategen 2016).</p> <p>There are 47 individual trees across the Project Area all of which have a diameter at breast height (DBH) greater than 500mm. Observations made in September 2020 (Kirkby) determined that the few hollows which may be suitable for use by CBC have not been used by and are unlikely to be used by CBC due to their shape. There was no evidence that CBC had</p>	Unlikely to be at variance

Principle	Assessment	Conclusion
	<p>used the larger hollows inspected in two of the trees at the site. The smaller hollows observed across the Project Area are used by feral bees and small parrots including the Australian Ringneck or Rainbow Lorikeet, both of which were observed in the area during the September 2020 survey (Kirkby).</p> <p>Within the Peel-Perth region and with respect to CBC, foraging and water resources within 6 km, as well as overlapping foraging within 12 km, are required to support roosting and breeding sites and maintain habitat connectivity to facilitate movement through the landscape (Groom, 2015). EPA (2019) noted the importance of nearby foraging and water to support roosting and breeding sites. The nearest roost confirmed to be used by CBC is located 4.6 km south east of the Project Area, with a further nine confirmed and potential sites within a 6 km radius. Based on Department of Biodiversity, Conservation and Attractions (DBCA) mapping (DBCA, 2018a; DBCA, 2018b) and the most recent native vegetation extent data (Department of Primary Industry and Regional Development (DPIRD) 2020) there is an estimated 1,365.38 ha of potential foraging habitat for CBC within 6 km of the project.</p> <p>The proposed clearing therefore constitutes an estimated 0.09% reduction in available habitat within the local area. Noting the above, the clearing of 47 individual trees will not reduce the amount of potential habitat for threatened fauna species in the local area as these trees do not provide, based on recent observations, foraging or roosting habitat for CBC (Kirkby 2020). The clearing of 1.2 ha area of foraging habitat with the Project Area is considered unlikely to significantly reduce foraging habitat for individuals utilising the roost sites in the vicinity of the Project Area.</p>	
(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora	<p>Clearing for the project is unlikely to be at variance to this principle.</p> <p>No threatened flora species were recorded within the Project Area or broader survey area. Given the completely degraded nature of the vegetation, it has been concluded that no rare flora species are likely to occur within the Project Area (Strategen, 2016).</p>	Unlikely to be at variance
(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community	<p>Clearing for the project is unlikely to be at variance to this principle.</p> <p>No threatened ecological communities (TEC) were recorded within the project or broader survey area. Given the significant degradation and weed infestation at the site, in combination with very few native vascular plant species, the area is not characteristic of the Banksia Woodland of the Swan Coastal Plain TEC. None of the key and species that are typical of this TEC (DoEE 2016) have been observed at the site (Strategen 2016).</p>	Unlikely to be at variance
(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared	<p>The Project Area is within the Drummond Botanical Subdistrict and the Swan Coastal Plan 2 IBRA subregion. The native vegetation observed with Project Area is characteristic of the Swan and Guildford vegetation complexes and the Pinjarra 1009 vegetation system and is in a completely degraded condition.</p> <p>Currently, 16.40% remains of the 18,184.82 ha pre-1750 extent of the Pinjarra 1009 vegetation system within the Swan Coastal Plain IBRA region and Swan Coastal Plain 2 IBRA subregion. Regarding the mapped vegetation complexes, 13.57% remains of pre-1750 extent of the Swan Complex while only 5.09% of</p>	Unlikely to be at variance.

Principle	Assessment	Conclusion
	<p>the Guildford Complex persists. 0.89 ha of vegetation consistent with the Guildford Complex will be impacted for the project, reducing the remaining regional extent of the Guildford Complex by 0.02% and the remaining local extent (10km) by 0.30%.</p> <p>While the proposed clearing will reduce the remaining regional extent of Guildford Complex by 0.02%, the vegetation is not considered a significant remnant of this vegetation complex due to its Completely Degraded condition.</p>	
(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	<p>The clearing of 1.2 ha comprising 47 <i>Eucalyptus rudis</i> trees is likely to be, despite the degraded nature of the vegetation within the Project Area, at variance to this principle.</p> <p>The Project Area is located immediately adjacent to a CCW (UFI 15440) associated with the Helena River. The vegetation within the Project Area is representative of wetland (riparian) vegetation, albeit in a completely degraded condition due to its highly modified structure, historical clearing and proximity to and impacts from adjacent urban land use.</p> <p>Given this proximity to the CCW and associated buffer area, 0.55 ha of the Project Area falls within a mapped Environmentally Sensitive Area (ESA) – the Helena River floodplain. The 47 <i>Eucalyptus rudis</i> individuals constitute the most significant riparian vegetation within the project clearing area.</p> <p>Strategen (2016) identified a further 132 <i>Eucalyptus rudis</i> trees and one <i>Eucalyptus wandoo</i> outside of the Project Area that are within the ESA. A further 46 trees were identified in the larger survey area (13.65 ha) (Strategen 2016). The location of the Project Area at the eastern edge of the mapped ESA means that project clearing will not cause the splitting, or fragmentation, of the riparian vegetation.</p> <p>The Project Area is to be landscaped with appropriate plantings of vegetation characteristic of the area and more specifically the CCW. A Construction Environmental Management Plan (CEMP) will include measures for the potential impacts from construction including altered runoff, sedimentation and the spread of weeds.</p>	Likely to be at variance.
(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	<p>Clearing for the project is not at variance to this principle.</p> <p>The Project Area and larger survey area comprise completely degraded and weed infested understorey vegetation with an upper storey of <i>Eucalyptus rudis</i>. The area has already been impacted by parkland clearing.</p> <p>DPIRD provides a series of natural resource maps for Western Australia that detail risk of land degradation through several processes (DPIRD, 2020). Due to the riparian nature of vegetation within the Project Area, the predominant risk of land degradation is through water erosion and waterlogging.</p> <p>Construction of Workshops Avenue from Coppershop Road to Lloyd Street and the clearing of up to 1.2 ha of completely degraded native vegetation is unlikely to result in appreciable degradation of the landscape. The proposed road will be located on a constructed embankment within the existing road reserve. All works will be completed within the road reserve and are to be designed to minimise any degradation. The design includes for significant landscaping of the new road alignment with the inclusion of stormwater runoff harvesting infrastructure and a shared bike/pedestrian path. Disturbance</p>	Unlikely to be at variance

Principle	Assessment	Conclusion
	<p>will be limited to clearing of weeds, vegetation and topsoil prior to earthworks commencing.</p> <p>A Construction Environmental Management Plan (CEMP) will include measures for the potential impacts from construction including altered runoff, sedimentation and the spread of weeds.</p>	
(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	<p>Clearing for the project is not at variance to this principle.</p> <p>The Helena River is a CCW that forms part of the larger Swan Canning River Park and associated Development Control Area (DCA). Development within and in the areas immediately adjacent to the DCA are managed by the Rivers and Estuaries Branch of DBCA on behalf of the Swan River Trust.</p> <p>Construction of Workshops Avenue has potential to impact on the environmental values of the adjacent CCW through clearing of native vegetation, construction related impacts, contaminated runoff and through the disturbance of existing contamination at the site.</p> <p>Preliminary design for the project indicates that the new road will be constructed at and above the existing land surface. Disturbance will be limited to clearing of weeds, vegetation and topsoil prior to earthworks commencing. If required by the approved design excavation may be required to facilitate the installation of drainage infrastructure including drains and stormwater basin(s). The new road alignment will be landscaped and planted following construction. The design includes elements that will enhance the CCW and improve access to the river floodplain (shared path).</p> <p>Clearing of up to 47 <i>Eucalyptus rudis</i> trees is unlikely to impact on the adjacent CCW and vegetation. The adjacent area of CCW includes a further 178 trees (<i>Eucalyptus rudis</i> or <i>Eucalyptus wandoo</i>) that comprise potential habitat for CBC with the CCW.</p> <p>Construction may encounter localised contaminated materials (small quantities of asbestos fragments adjacent to the Western Paddock) that was encountered during the recent preliminary site investigation. It is possible that the southern batter of the Western Paddock contaminated material stockpile may be disturbed to allow construction of the final alignment. A consequence of this disturbance is that contaminated soils, asbestos and surface runoff may enter the Helena River floodplain during period of rainfall.</p> <p>The risk of disturbance of localised contaminated materials, the southern batter of the Western Paddock contaminated material stockpile and management/control of surface water runoff, if required, will be managed/completed in accordance with the project construction environmental management plan (CEMP).</p> <p>The Project Area has been mapped as having a moderate to low risk of acid sulfate soils (ASS) (DWER, 2019). The maximum depth of excavation below existing ground level is less than 3.0m and is not expected to impact ASS that may occur at the site.</p> <p>A CEMP will provide the necessary measures for the management of surface runoff, contaminated material and ASS should these materials be encountered and dewatering, if required, to allow construction to proceed.</p> <p>Measures that may implemented include and are not limited to:</p>	Unlikely to be at variance

Principle	Assessment	Conclusion
	<ul style="list-style-type: none"> SPOCAS testing of potential ASS to determine liming requirements should excavation of insitu soils be required during construction. Temporary stormwater control basins will be constructed to intercept potentially contaminated runoff so that it does not impact on the Helena River and floodplain. 	
(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	<p>Clearing for the project is not at variance to this principle.</p> <p>The Helena River is a CCW that forms part of the larger Swan Canning River Park and associated Development Control Area (DCA). Development within and in the areas immediately adjacent to the DCA are managed by the Rivers and Estuaries Branch of DBCA on behalf of the Swan River Trust.</p> <p>Construction of Workshops Avenue has potential to impact on the quality of surface and underground water through clearing of native vegetation, construction related contamination of stormwater runoff and through the disturbance of existing contamination at the site.</p> <p>Preliminary design for the project indicates that the new road will be constructed at and above the existing land surface. Disturbance will be limited to clearing of weeds, vegetation and topsoil prior to earthworks commencing. If required by the approved design excavation may be required to facilitate the installation of drainage infrastructure including drains and stormwater basin(s).</p> <p>Construction of Workshops Avenue may encounter localised contaminated materials (small quantities of asbestos fragments adjacent to the Western Paddock) that was encountered during the recent preliminary site investigation. It is possible that the southern batter of the Western Paddock contaminated material stockpile may be disturbed to allow construction of the final alignment. A consequence of this disturbance is that contaminated soils, asbestos and surface runoff may enter the Helena River floodplain during period of rainfall.</p> <p>Disturbance of localised contaminated materials, the southern batter of the Western Paddock contaminated material stockpile and management/control of surface water runoff, if required, will be completed in accordance with the project construction environmental management plan (CEMP).</p> <p>The Project Area has been mapped as having a moderate to low risk of acid sulfate soils (ASS) (DWER, 2019). The maximum depth of excavation below existing ground level is less than 3.0m and is not expected to impact ASS that may occur at the site. A CEMP will provide the necessary measures for the management of surface runoff, contaminated material and ASS should these materials be encountered, and dewatering if required to allow construction to proceed.</p> <p>Measures that may implemented include and are not limited to:</p> <ul style="list-style-type: none"> SPOCAS testing of potential ASS to determine liming requirements should excavation of insitu soils be required during construction. Temporary stormwater control basins will be constructed to intercept potentially contaminated runoff so that it does not impact on the Helena River and floodplain. 	Unlikely to be at variance
(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or	<p>Clearing for the project is not at variance to this principle.</p> <p>The project is located immediately adjacent to a 100 year ARI floodway. Construction of Workshops Avenue will occur at and</p>	Unlikely to be at variance

Principle	Assessment	Conclusion
exacerbate, the incidence of flooding	<p>above existing ground level with the proposed earthworks/project unlikely to impact on flow within the Helena River and associated floodplain. It is considered that the risk of flooding as a result of the construction of the project is low to negligible.</p> <p>Work will be confined to the road reserve for Workshops Avenue and no access is anticipated through or into the adjacent DCA during construction.</p> <p>Construction will be completed in accordance with the project construction environmental management plan (CEMP) which will provide details of restricted areas</p>	

4. Conclusion

The following measures are proposed to reduce, minimise and mitigate the impacts.

- Clear demarcation of investigation locations (inclusive of test pit, spoil stockpiles and access tracks)
- Seed and hygiene controls for equipment and personnel
- Accurate and well-maintained clearing records during and post clearing
- Cleared vegetation will be placed across cleared areas on completion of the site works.

The findings of the assessment against the ten clearing principles are presented in Table 4.1 below.

Table 4.1: Summary of Clearing Assessment

Clearing Principle	Finding
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity	Unlikely to be at variance
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	Unlikely to be at variance
(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora	Unlikely to be at variance
(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community	Unlikely to be at variance
(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared	Unlikely to be at variance
(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	Likely to be at variance.
(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	Unlikely to be at variance
(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	Unlikely to be at variance
(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	Unlikely to be at variance
(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Unlikely to be at variance

5. Limitations

Scope of services

This report ("the report") has been prepared by Strategen-JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Strategen-JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

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Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

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Appendix A Strategen Survey flora and vegetation survey report 2016



Workshops Avenue, Midland

Level 1 Flora and vegetation survey and black cockatoo habitat assessment report

Prepared for
Metropolitan Redevelopment Authority
by Strategen

November 2016



Workshops Avenue, Midland

Level 1 Flora and vegetation survey and black cockatoo habitat assessment report

Strategen is a trading name of
Strategen Environmental Consultants Pty Ltd
Level 1, 50 Subiaco Square Road Subiaco WA 6008
ACN: 056 190 419

November 2016

Limitations

Scope of services

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Client: Metropolitan Redevelopment Authority

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Appendix 1 Vascular plant taxa recorded within the survey area
Appendix 2 Photographic record of vegetation types
Appendix 3 Desktop assessment results (Parks and Wildlife 2007-, DEE 2016b)
Appendix 4 Conservation significant flora and ecological community definitions

1. Introduction

This report presents the findings of a Level 1 flora and vegetation survey and black cockatoo habitat assessment undertaken to support the Local Structure Plan (LSP) for the Midland WA Police Operations Support Facility, Curtin University and River Road.

1.1 Background

The Metropolitan Redevelopment Authority (MRA) is seeking to lodge an LSP for the Midland WA Police Operations Support Facility, Curtin University and River Road in Midland, approximately 15 km northeast of the Perth CBD (Figure 1). A Local Water Management Strategy (LWMS) has been prepared and submitted to regulatory agencies to support the LSP. The LWMS was reviewed by the Department of Water (DoW) and the Department of Parks and Wildlife (Parks and Wildlife) who have requested that more detailed information regarding the nature and condition of native vegetation in the LWMS area be provided.

A Level 1 flora and vegetation survey was undertaken within the survey area depicted in Figure 1 to determine the nature and condition of native vegetation contained within as per the DoW and Parks and Wildlife comments. This survey was undertaken in accordance with *Guidance Statement 51 – Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia* (GS 51; EPA 2004) and *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (Parks and Wildlife 2015a).

A number of trees within the survey area may be cleared to facilitate development. Clearing of these trees may result in the removal of vegetation potentially containing habitat for Forest Red-tailed Black-Cockatoos (FRTBC), Baudin's Black-Cockatoos (BBC) and Carnaby's Black-Cockatoos (CBC). All three species of black cockatoos are listed as Threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Wildlife Conservation Act 1950* (WC Act). Consequently a black cockatoo habitat assessment was also undertaken within the survey area to quantify the value of habitat for the three species contained within.

1.2 Scope

The scope of this Level 1 flora and vegetation survey and black cockatoo habitat assessment was to undertake a desktop assessment and field assessment within the survey area (Figure 1).

The objectives were to:

- conduct a desktop assessment identifying flora and vegetation values which have been identified as being present in or around the survey area
- collect and identify the vascular plant species present within the survey area
- define and map the native vegetation communities present within the survey area
- map vegetation condition within the survey area
- define and map black cockatoo habitat within the survey area
- prepare a report summarising the findings.

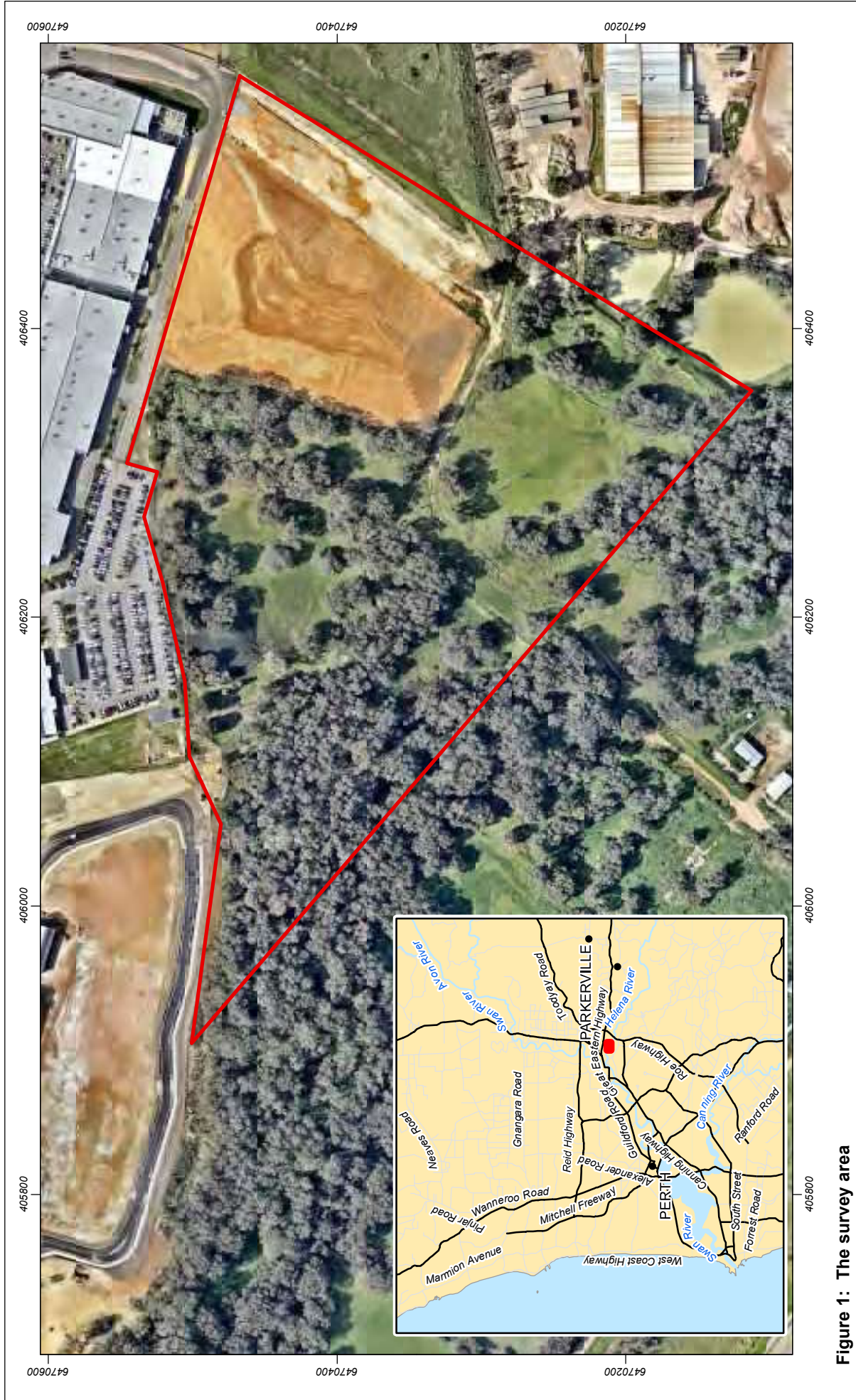
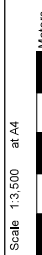



Figure 1: The survey area

Scale 1:3 500 at A4


 Meters

 Legend

 Survey area

Coordinate System: GDA 1984 MGA Zone 50

 Note that positional errors may occur in some areas

 Date: 25/09/2016

 Author: DWWhite

 Source: Aerial; Nearmaps July 2016; regional mapping; SLIP Landgate 2016.

2. Context

2.1 Legislative context

This biological survey has been conducted with reference to the following Australian and Western Australian legislation:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – Australian Government
- *Wildlife Conservation Act 1950* (WC Act) – State
- *Environmental Protection Act 1986* (EP Act) – State
- *Biosecurity and Agriculture Management Act 2007* (BAM Act) – State.

2.1.1 Conservation significant flora and ecological communities

Conservation significant flora and ecological communities are determined at a state and federal legislative level. Threatened species are listed under the EPBC Act at the Australian Government level and under the WC Act at the State level (Appendix 4). Priority species are listed by the Department of Parks and Wildlife (Parks and Wildlife) and include species of 'significant conservation value' (Appendix 4).

Threatened Ecological Communities (TECs) are listed under both the EPBC Act and EP Act (Appendix 4). Priority Ecological Communities (PECs) are listed by Parks and Wildlife and include species of significant conservation value (Appendix 4).

2.1.2 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are protected under the EP Act, and include the following:

- World Heritage areas
- areas included on the National Estate Register
- defined wetlands and associated buffers
- vegetation within 50 m of a listed Threatened species
- TECs.

2.1.3 Protection of native vegetation

Native vegetation is defined under the EP Act as "indigenous aquatic or terrestrial vegetation, and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded from this definition but does not include vegetation in a plantation".

This definition of native vegetation does not include vegetation that was intentionally sown, planted or propagated unless either of the following applies:

- (a) the vegetation was sown, planted or propagated as required under the EP Act or another written law
- (b) the vegetation is declared to be native under Regulation 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Regulation 4 prescribes the kinds of intentionally planted indigenous vegetation that are “native vegetation” and which therefore require a clearing permit or exemption to clear and includes:

- (a) planting that was funded (fully or partly)
 - i. by a person who was not the owner of the land
 - ii. for the purpose of biodiversity conservation or land conservation
- (b) intentionally planted vegetation that has one of the following:
 - i. a conservation covenant or agreement to reserve under section 30B of the *Soil and Land Conservation Act 1945*
 - ii. a covenant to conserve under section 21A of the *National Trust of Australia (WA) Act 1964*
 - iii. restrictive covenant to conserve under section 129B of the *Transfer of Land Act 1983*
 - iv. some other form of binding or undertaking to establish and maintain, or maintain, the vegetation.

Native vegetation can only be cleared with a clearing permit, unless for some circumstances where exemptions apply pursuant to the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (the Regulations). Clearing permits issued pursuant to the Regulations may be issued as area permits or purpose permits. Exemptions for clearing under Regulation 5 of the Regulations do not apply within ESAs.

2.1.4 Fauna

Species of fauna are defined as Threatened where their populations are under threat, require protection or are protected under an international agreement. Parks and Wildlife recognises these threats of extinction and consequently applies regulations towards population and species protection.

Threatened fauna species are protected under section 16 of the WC Act. Under the Act, it is an offence to “take, destroy or possess” Threatened fauna without Ministerial approval.

Threatened fauna (Schedule 1) are further ranked by Parks and Wildlife according to their threat using International Union for Conservation of Nature (IUCN) Red List criteria that are described as follows:

- CR Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
- EN Endangered – considered to be facing a very high risk of extinction in the wild
- VU Vulnerable – considered to be facing a high risk of extinction in the wild.

Priority fauna not listed as Threatened (Scheduled) under the WC Act, but are poorly known or poorly represented in the conservation estate are regarded as Priority and attention is given to their conservation by Parks and Wildlife.

Threats of extinction of fauna species are also recognised at a Commonwealth level and are categorised according to the EPBC Act, administered by the Department of the Environment and Energy (DEE).

Migratory species are MNES under the EPBC Act. Migratory species are defined as animals that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations. Recognised migratory species include any native species identified in an international agreement approved by the Minister and those listed under:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- China-Australia Migratory Bird Agreement (CAMBA)
- Japan-Australia Migratory Bird Agreement (JAMBA)
- Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA).

2.1.5 Introduced species

The BAM Act provides for management and control of listed organisms, including introduced flora species (weeds). Species listed as declared pests under the BAM Act are classified under three categories:

- C1 Exclusion: Pests assigned under this category are not established in Western Australia, and control measures are to be taken to prevent them entering and establishing in the State
- C2 Eradication: Pests assigned under this category are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility
- C3 Management: Pests assigned under this category are established in Western Australia, but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area that is currently free of that pest.

Under the BAM Act, land managers are required to manage populations of declared pests as outlined under the relevant category.

2.2 Environmental setting

2.2.1 Soils and topography

The survey area is located within the Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion) of Western Australia (Mitchell *et al.* 2002). The Swan Coastal Plain comprises five major geomorphologic systems that lie parallel to the coast, namely (from west to east) the Quindalup Dunes, Spearwood Dunes, Bassendean Dunes, Pinjarra Plain and Ridge Hill Shelf (Churchward & McArthur 1980; Gibson *et al.* 1994). Each major system is composed of further subdivisions in the form of detailed geomorphologic units (Churchward & McArthur 1980; Semeniuk 1990; Gibson *et al.* 1994). Beard (1990) describes the Swan Coastal Plain as a low-lying coastal plain, often swampy, with sandhills also containing dissected country rising to the duricrusted Dandaragan plateau on Mesozoic, mainly sandy, yellow soils.

2.2.2 Climate

The Midland locality experiences a Mediterranean climate characterised by mild, wet winters and warm to hot, dry summers. The nearest Bureau of Meteorology (BoM) weather station at Perth Airport (Station No. 9021) provides average monthly climate statistics for the Midland locality (Figure 2). Average annual rainfall recorded at Perth Airport since 1944 is 767.4 mm (BoM 2016). Rainfall may occur at any time of year; however, most occurs in winter in association with cold fronts from the southwest. Highest temperatures occur between December and March, with average monthly maximums ranging from 29°C in December to 32°C in February (BoM 2016). Lowest temperatures occur between June and September, with average monthly minimums ranging from 8°C in July to 9°C in June (BoM 2016).

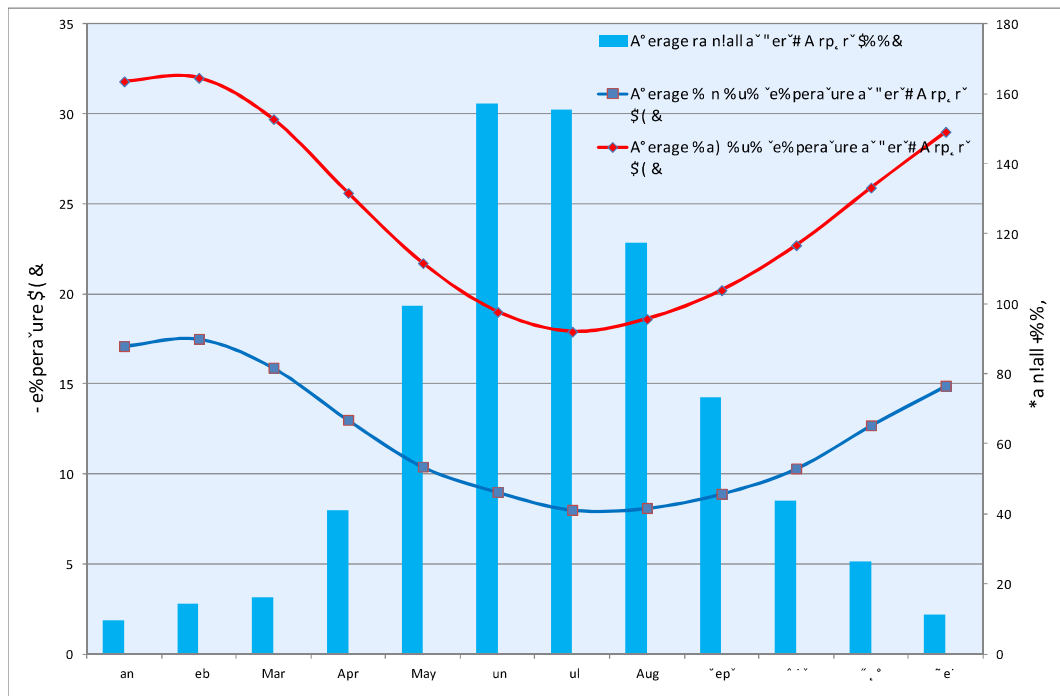


Figure 2: Mean monthly climatic data (temperature and rainfall) for Perth Airport

2.2.3 Regional vegetation

Vegetation occurring within the region was initially mapped at a broad scale (1:1 000 000) by Beard during the 1970s. This dataset has formed the basis of several regional mapping systems, including physiographic regions defined by Beard (1981) which led to the delineation of botanical districts as described in Beard (1990); the biogeographical region dataset (Interim Biogeographic Regionalisation for Australia, IBRA) for Western Australia (DEE 2016a) and vegetation association mapping as defined in Government of Western Australia (2016).

Beard (1990) Botanical Subdistrict

The survey area occurs within the Drummond Botanical Subdistrict which is characterised by low *Banksia* woodlands on leached sands; *Melaleuca* swamps on poorly-drained depressions; and *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri) woodlands on less leached soils (Beard 1990).

IBRA subregion

IBRA describes a system of 85 'biogeographic regions' (bioregions) and 403 subregions covering the entirety of the Australian continent (Thackway & Cresswell 1995). Bioregions are defined on the basis of climate, geology, landforms, vegetation and fauna.

The survey area occurs within the Swan Coastal Plain 2 IBRA subregion which is dominated by *Banksia* or Tuart on sandy soils, *Casuarina obesa* on outwash plains and paperbark (*Melaleuca*) in swampy areas (Mitchell et al. 2002).

System 6 and vegetation system association mapping

System 6 mapping refers to vegetation mapping undertaken at a Vegetation Complex scale by Heddlé *et al.* (1980). This is the primary source of information used to calculate potential impacts of proposals to clear native vegetation on the Swan Coastal Plain. The survey area occurs within the Guildford and Swan complexes (Figure 3) which are described as:

- Guildford: A mixture of open forest to tall open forest of *Corymbia calophylla*-*Eucalyptus wandoo*-*E. marginata* and woodland of *E. wandoo* (with rare occurrences of *E. lane-poolei*). Minor components include *E. rudis*-*Melaleuca raphiophylla*
- Swan: Fringing woodland of *E. rudis*-*M. raphiophylla* with localised occurrence of low open forest of *Casuarina obesa*-*M. cuticularis*.

Vegetation system association mapping is also used to calculate potential impacts of proposals to clear native vegetation on the Swan Coastal Plain. The current and pre-European extent of these associations is published annually by Parks and Wildlife, the latest of which is contained within Government of Western Australia (2016). The survey area occurs within the following vegetation system associations as depicted in Figure 3 and described below:

- Bassendean 1001: Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina
- Pinjarra 1009: Medium woodland; marri & river gum.

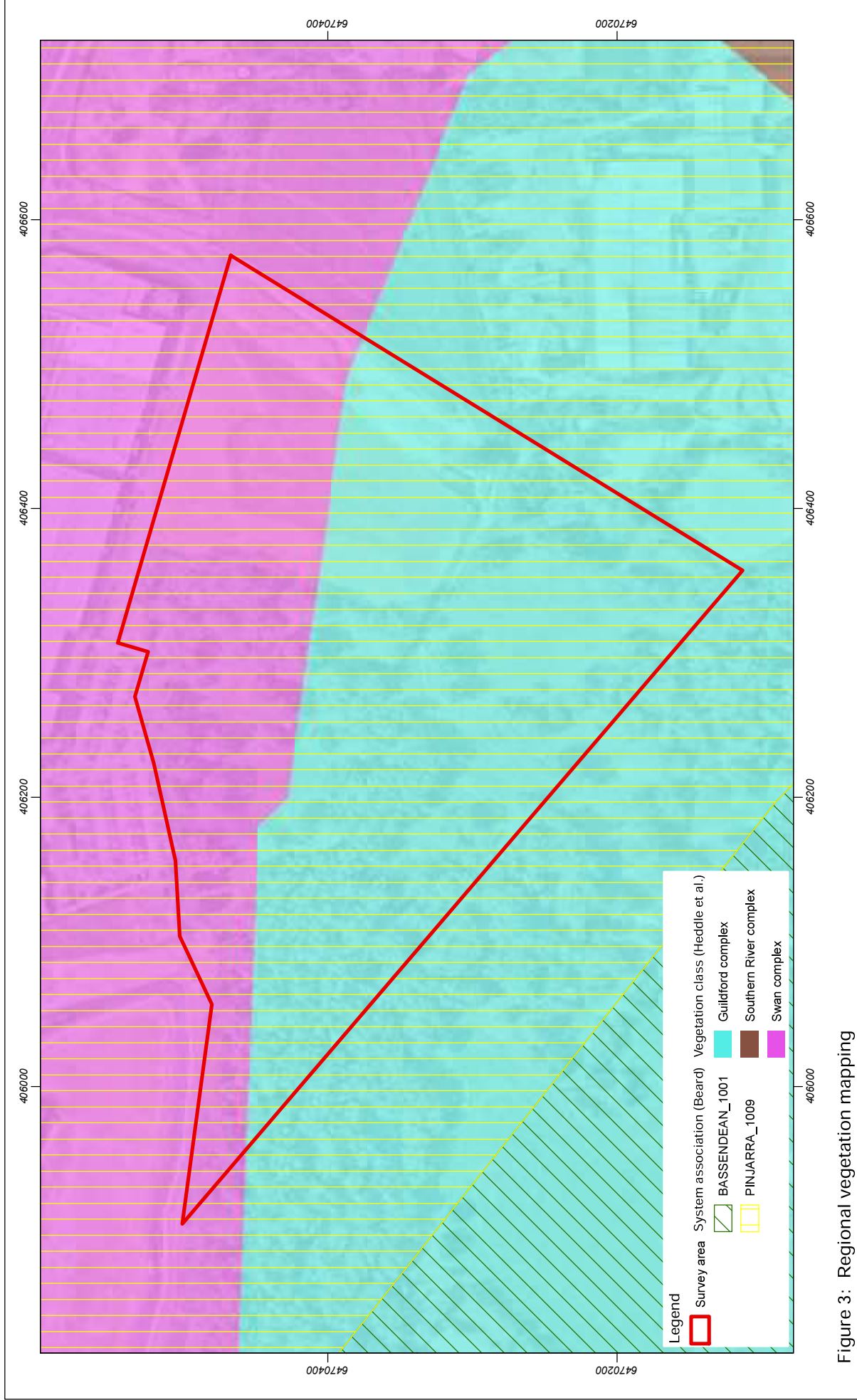


Figure 3: Regional vegetation mapping

3. Methods

3.1 Flora and vegetation

3.1.1 Desktop assessment

A desktop assessment was conducted using Florabase, Parks and Wildlife, and Department of the Environment and Energy (DEE) databases to identify the possible occurrence of TECs, PECs and Threatened and Priority flora potentially occurring within the survey area. Reports that document regional flora, vegetation and fauna within the surrounds of the survey area were also reviewed prior to the field assessment.

Database search requests were also submitted to the Species and Communities branch of Parks and Wildlife to identify any potential Threatened/Priority flora and/or TECs or PECs within 5 km of the survey area.

The WA Atlas database was also queried to identify any geomorphic wetlands or ESAs occurring within proximity to the survey area (Landgate 2016).

3.1.2 Field assessment

The field survey was conducted according to standards set out in GS 51 and *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2004; Parks and Wildlife 2015a). The assessment of flora and vegetation within the survey area was undertaken by Strategen personnel on 18 August 2016. The survey area was traversed on foot to record changes in vegetation structure and type and eight vegetation quadrats were surveyed to identify vegetation types (Appendix 1; Appendix 2).

Site selection for vegetation mapping was based on differences in structure and species composition of the communities present within the survey area. Vegetation mapping sites were determined from aerial photographs. The survey area was traversed on foot, allowing for opportunistic sites to be placed where a change in vegetation structure or composition was observed.

Flora and vegetation was described and sampled systematically at each quadrat and additional opportunistic collecting was undertaken wherever previously unrecorded plants were observed. At each site the following floristic and environmental parameters were noted:

- GPS location
- topography
- soil type and colour
- outcropping rocks and their type
- percentage cover and average height of each vegetation stratum.

For each vascular plant species, the average height, number of plants and percent cover were recorded.

All plant specimens collected during the field surveys were identified using appropriate reference material or through comparisons with pressed specimens housed at the Western Australian Herbarium where necessary. Nomenclature of the species recorded is in accordance with Western Australian Herbarium (1998-).

3.1.3 Data analysis and vegetation mapping

Due to the degraded nature and uniform distribution of vegetation within the survey area; quadrat data were grouped into a species by site matrix to delineate individual vegetation types (VTs) present within the survey area. Aerial photography interpretation and field notes taken during the survey were then used to develop VT mapping polygon boundaries over the survey area. These polygon boundaries were then digitised using Geographic Information System (GIS) software.

VT descriptions (though floristic in origin) have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 6.0 (ESCAVI 2003), a system of describing structural vegetation units (based on dominant taxa). This model follows nationally-agreed guidelines to describe and represent vegetation types, so that comparable and consistent data is produced nation-wide. For the purposes of this report, a VT is considered equivalent to a NVIS sub-association as described in ESCAVI (2003).

Vegetation condition was recorded at all quadrats, and also opportunistically within the survey area during the field assessment where required. Vegetation condition was described using the vegetation condition scale for the South West Botanical Province (Keighery 1994). Vegetation condition polygon boundaries were developed using this information in conjunction with aerial photography interpretation, and were digitised as for vegetation type mapping polygon boundaries.

3.1.4 Survey limitations and constraints

Table 1 displays the evaluation of the flora and vegetation assessment against a range of potential limitations that may have an effect on that assessment. Based on this evaluation, the assessment has not been subject to constraints that would affect the thoroughness of the assessment and the conclusions reached.

Table 1: Flora and vegetation survey potential limitations and constraints

Potential limitation	Impact on assessment	Comment
Sources of information and availability of contextual information (i.e. pre-existing background versus new material).	Not a constraint.	The survey has been undertaken in the Drummond Botanical Subdistrict on the Swan Coastal Plain which has been well studied and documented with ample literature available (Beard 1990).
Scope (i.e. what life forms, etc., were sampled).	Not a constraint.	The degraded nature and uniform distribution of vegetation within the survey area has resulted in species which define vegetation types being identified. The low number of annual species recorded is likely a result of heavy weed infestation rather than survey timing.
Proportion of flora/fauna collected and identified (based on sampling, timing and intensity).	Not a constraint.	The proportion of flora surveyed was adequate for a Level 1 survey. The entire survey area was traversed and flora species were recorded systematically.
Completeness and further work which might be needed (i.e. was the relevant survey area fully surveyed).	Not a constraint	The information collected during the survey was sufficient to assess the vegetation that was present during the time of the survey.
Mapping reliability.	Not a constraint.	Aerial photography of a suitable scale was used to map the survey area and identify potential fauna habitat. Sites were chosen from these aerials to reflect changes in community structure. Opportunistic sites were also used if differences were observed during on ground reconnaissance. Vegetation types were assigned to each site based on topography, soil type and presence/absence and percent foliage cover of vegetation.
Timing, weather, season, cycle.	Not a constraint.	Flora and vegetation surveys are normally conducted following winter rainfall in the South-West Province, ideally during spring (EPA 2004). The field assessment was conducted as per the requirements of a Level 1 survey in late August following significant winter rainfall and therefore timing is not likely to have been a constraint.
Disturbances (fire flood, accidental human intervention, etc.).	Not a constraint.	The survey area and regional surrounds have been subject to disturbance over a significant period of time. Given the wide range of this disturbance, this is not considered to be a limitation within the survey area.
Intensity (in retrospect, was the intensity adequate).	Not a constraint.	The survey area was traversed on foot and all differences in vegetation structure were recorded appropriately.
Resources (i.e. were there adequate resources to complete the survey to the required standard).	Not a constraint.	The available resources were adequate to complete the survey.
Access problems (i.e. ability to access survey area).	Not a constraint.	Existing tracks enabled adequate access to survey the vegetation and fauna within the survey area. Where access was not available by car, the area was easily traversed by foot.
Experience levels (e.g. degree of expertise in species identification to taxon level).	Not a constraint.	All survey personnel have the appropriate training in sampling and identifying the flora of the region.

3.2 Black cockatoo habitat assessment

The survey area was inspected on 18 August 2016 by Strategen personnel with relevant experience as specified by the *EPBC Act Referral guidelines for three threatened black cockatoo species* (DSEWPac [now DEE] 2012). The inspection included:

- a vegetation assessment to identify vegetation communities and potential black cockatoo foraging species
- a significant tree assessment to identify any trees with the potential to be utilised by black cockatoos for breeding.

3.2.1 Vegetation and foraging assessment

The survey area was traversed on foot to record any flora species with the potential to provide a food source for black cockatoos. Following the assessment, vegetation units defined as part of the flora and vegetation survey were assigned a foraging value based on the presence and quantity of potential food species and any evidence of foraging by black cockatoos.

3.2.2 Significant tree assessment

Significant trees are defined as trees of suitable species with a diameter at breast height (DBH) greater than 500 mm (> 300 mm for salmon gum and wandoo) (DSEWPac 2012). Tree species which are considered to be potential breeding or roosting trees are outlined in Table 2. Trees with a DBH greater than 500 mm (or >300 mm for salmon gum and wandoo) are large enough to potentially contain hollows suitable for nesting black cockatoos, or have the potential to develop suitable hollows over the next 50 years. Trees of this size may also be large enough to provide roosting habitat (i.e. trees which provide a roost or rest area for the birds). The locations of such trees within the survey area were recorded using a Global Positioning System (GPS) device. In addition to the location and DBH, the species of each tree was also recorded.

Table 2: Black cockatoo potential breeding tree species (Groom 2011, DSEWPac 2012)

Scientific name	Common name	Breeding	Roosting
<i>Corymbia calophylla</i>	Marri	Yes	Yes
<i>Corymbia maculata</i>	Spotted Gum		Yes
<i>Eucalyptus accedens</i>	Powderbark	Yes	
<i>Eucalyptus camaldulensis</i>	River Red Gum		Yes
<i>Eucalyptus citriodora</i>	Lemon Scented Gum		Yes
<i>Eucalyptus diversicolor</i>	Karri	Yes	
<i>Eucalyptus globulus</i>	Tasmania Blue Gum		Yes
<i>Eucalyptus gomphocephala</i>	Tuart	Yes	Yes
<i>Eucalyptus grandis</i>	Flooded Gum, Rose Gum		Yes
<i>Eucalyptus longicornis</i>	Red Morrell	Yes	
<i>Eucalyptus loxophleba</i>	York Gum	Yes	
<i>Eucalyptus marginata</i>	Jarra	Yes	Yes
<i>Eucalyptus megacarpa</i>	Bullich	Yes	Yes
<i>Eucalyptus occidentalis</i>	Swamp Yate	Yes	
<i>Eucalyptus patens</i>	Blackbutt	Yes	Yes
<i>Eucalyptus robusta</i>	Swamp Mahogany		Yes
<i>Eucalyptus rudis</i>	Flooded Gum	Yes	Yes
<i>Eucalyptus salmonophloia</i>	Salmon Gum	Yes	
<i>Eucalyptus salubris</i>	Gimlet	Yes	
<i>Eucalyptus wandoo</i>	Wandoo	Yes	Yes
<i>Pinus pinaster</i>	Pinaster, Maritime Pine		Yes
<i>Pinus radiata</i>	Monterey, Radiata Pine		Yes

4. Results

4.1 Flora and vegetation

4.1.1 Desktop assessment results

A total of 752 vascular plant taxa from 89 plant families have the potential to occur within the survey area (Parks and Wildlife 2007-; DEE 2016b). The majority of taxa were from within the Fabaceae (84 taxa), Proteaceae (58 taxa) and Myrtaceae (51 taxa) families which is typical of the Swan Coastal Plain.

Threatened and Priority flora

A desktop survey for Threatened and Priority flora that may potentially occur within the survey area was undertaken using NatureMap (Parks and Wildlife 2007-), the Western Australian Herbarium (Western Australian Herbarium 1998-), and the DEE Protected Matters Search Tool (DEE 2016b). Database search requests were also submitted to the Parks and Wildlife Species and Communities branch. Results from the Parks and Wildlife database are presented in Figure 4.

Flora within Western Australia that is considered to be under threat may be classed as either Threatened flora or Priority flora. Where flora has been gazetted as Threatened flora under the WC Act, the taking of such flora without the written consent of the Minister is an offence. The WC Act defines “to take” flora as to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means. Parks and Wildlife (2015b) contains the current list of Threatened flora in Western Australia.

Priority flora are considered to be species which are potentially under threat, but for which there is insufficient information available concerning their distribution and/or populations to make a proper evaluation of their conservation status. Parks and Wildlife categorises Priority flora according to their conservation priority using five categories, P1 (highest conservation significance) to P5 (lowest conservation significance), to denote the conservation priority status of such species. Priority flora species are regularly reviewed and may have their priority status changed when more information on the species becomes available. Appendix 4 defines levels of Threatened and Priority flora (Western Australian Herbarium 1998-).

At the national level, the EPBC Act lists Threatened species as extinct, extinct in the wild, critically endangered, endangered, vulnerable, or conservation dependent. Appendix 4 defines each of these categories of Threatened species. The EPBC Act prohibits an action that has or will have a significant impact on a listed Threatened species without approval from the Australian Government Minister for the Environment. The current EPBC Act list of Threatened flora may be found on the (DEE 2016c) website.

Table 3 shows the Threatened and Priority flora potentially occurring within the survey area. The desktop assessment identified 19 Threatened flora species and 34 Priority flora species that have been recorded in the regional area. Of these, based on specific habitat requirements, six Threatened flora species and five Priority flora species were considered to have the potential to occur within the survey area as listed below:

- *Calytrix breviseta* subsp. *breviseta* (Threatened – Endangered)
- *Trithuria occidentalis* (Threatened – Endangered)
- *Conospermum undulatum* (Threatened – Vulnerable)
- *Diuris micrantha* (Threatened – Vulnerable)
- *Drakaea macrantha* (Threatened – Vulnerable)
- *Synaphea* sp. Pinjarra Plain (Threatened [WC Act only])
- *Bolboschoenus medianus* (P1)
- *Grevillea bipinnatifida* subsp. *pagna* (P1)
- *Lasiopetalum bracteatum* (P4)
- *Schoenus griffinianus* (P4).

Table 3: Threatened and Priority flora potentially occurring within the survey area

Species	Conservation status		Description	Potential to occur
	EPBC Act	WC Act		
<i>Andersonia gracilis</i>	Threatened: Endangered	Threatened	A slender erect or open straggly shrub approximately from 0.1 m to 0.5 m tall. Flowers are white-pink-purple and visible from September to November. Habitat for this species is white/grey sand, sandy clay and gravelly loam substrates, in winter-wet areas near swamps (Western Australian Herbarium 1998-; DEE 2016d). Species only known from the Badgingarra, Kenwick and Dandaragan areas where it is found on seasonally damp, black sandy clay flats near or on the margins of swamps; often on duplex soils supporting low open heath vegetation with species such as <i>Calothamnus hirsutus</i> , <i>Verticordia densiflora</i> and <i>Kunzea recurva</i> over sedges (DEE 2016d).	Unlikely – Known species range does not occur within the survey area and preferred habitat unlikely to occur within the survey area.
<i>Caladenia huegelii</i>	Threatened: Endangered	Threatened	A slender orchid 30 to 50 cm tall. One or two striking flowers characterised by a greenish-cream lower petal with a maroon tip. Other petals are cream with red or pink suffusions. Habitat for this species occurs within well-drained, deep sandy soils in low mixed Banksia, Allocasuarina and Jarrah woodlands (Western Australian Herbarium 1998-; DEE 2016d).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Calyptrix breviseta</i> subsp. <i>breviseta</i>	Threatened: Endangered	Threatened	An erect or spreading shrub, 40 to 100 cm high. Flowers are purple-blue in October to November. Habitat for this species occurs in sandy clay, winter-wet swampy flats in low heath (DEE 2015d).	Possible – Preferred habitat may occur within the survey area.
<i>Chamelaucium</i> sp. <i>Gingin</i>	Threatened: Endangered	Threatened	An open straggly shrub growing 1 to 2 m high with many slender, stiff branches. The species is confined to the Gingin/Chittering area and occurs on white/yellow sand supporting open low woodland with <i>Eucalyptus tottiana</i> , <i>Banksia attenuata</i> and <i>Hibbertia</i> spp. (DEE 2016d).	Unlikely – Known species range does not occur within the survey area and preferred habitat unlikely to occur within the survey area.
<i>Diuris purdiei</i>	Threatened: Endangered	Threatened	A slender orchid to 0.35 m tall. Flowers are yellow and visible from September to October. Habitat for this species is grey-black sand substrates in winter-wet swamps which have high moisture (Western Australian Herbarium 1998-). <i>Diuris purdiei</i> occurs from Perth south to near the Whicher Range, within the Swan (Western Australia) Natural Resource Management Region. It grows on sand to sandy clay soils, in areas subject to winter inundation, and amongst native sedges and dense heath with scattered emergent <i>Melaleuca preissiana</i> , <i>Corymbia calophylla</i> , <i>E. marginata</i> and <i>Nuytsia floribunda</i> (DEE 2016d).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Drakaea elastica</i>	Threatened – Endangered	Threatened	A slender orchid to 30 cm tall with a prostrate, round to heart shaped leaf. Singular, bright green, glossy flower. <i>Drakaea elastica</i> is currently known only from the Swan Coastal Plain over a range of approximately 350 km between Cataby in the north and Busselton in the south. The species is known to grow on bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps (DEE 2016d). The species typically grows in Banksia (<i>Banksia menziesii</i> , <i>B. attenuata</i> and <i>B. ilicifolia</i>) woodland or Spearwood (<i>Kunzea glabrescens</i>) thicket vegetation.	Unlikely – Preferred habitat does not occur within the survey area.
<i>Eucalyptus balanites</i>	Threatened: Endangered	Threatened	A mallee to 5 m tall. Bark is rough and flaky. Flowers are white and visible October to December, or from January to February (Western Australian Herbarium 1998-). Habitat for this species is sandy soils with lateritic gravel (DEE 2016d).	Unlikely – Preferred habitat unlikely to occur within the survey area.

Species	Conservation status		Description	Potential to occur
	EPBC Act	WC Act		
<i>Grevillea curviloba</i> subsp. <i>incurva</i>	Threatened: Endangered	Threatened	A prostrate to erect shrub from 0.1 m to 2.5 m tall. Flowers are white-cream and visible August to September. Habitat for this species is sand and sandy loam substrates in winter-wet heath (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Lepidosperma rostratum</i>	Threatened: Endangered	Threatened	Rhizomatous tufted perennial, grass-like or herb (sedge), to 0.5 m high. Flowers are brown. Grows in peaty sand and clay amongst low heath, in winter wet swamps. Overstorey species that have been associated with this species include <i>Banksia telmateia</i> (Marsh Banksia) and <i>Calothamnus hirsutus</i> (Hairy Clawflower) (DEE 2016d).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Macarthuria keigheryi</i>	Threatened: Endangered	Threatened	A small erect shrub up to 40 cm tall with hairy, bright yellow to green stem. Habitat for the species is found in low-lying winter-wet damp, grey/white sands and grows in open patches with low tree canopy cover among heathland, jarrah (<i>Eucalyptus marginata</i>) and Allocasuarina/Banksia woodland at Welshpool and Kewdale; and Banksia/Eucalyptus woodland at the Dandaragan population. Associated species include <i>Kingia australis</i> , <i>Banksia attenuata</i> , <i>B. menziesii</i> , <i>Eremaea pauciflora</i> , <i>Nuytsia floribunda</i> , <i>Melaleuca sericata</i> , <i>Paterosonia occidentalis</i> and <i>Alexgeorgea nitens</i> in the Welshpool/Kewdale area and <i>Banksia menziesii</i> , <i>B. attenuata</i> , <i>Eucalyptus tottiana</i> and <i>Nuytsia floribunda</i> in the Cooljarloo area (DEE 2016d).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Thelymitra dedmaniarum</i>	Threatened: Endangered	Threatened	A tuberous orchid to 80 cm tall. Flowers are yellow and visible from November-December. Habitat for the species occurs on or near granite outcrops in <i>Eucalyptus wandoo</i> and <i>E. accedens</i> woodlands on red-brown sandy-loam soils. The species is known from three areas northwest of Perth; two northwest of Gidgegannup and one northwest of Gingin (DEE 2016d).	Unlikely – Known species range does not occur within the survey area and preferred habitat unlikely to occur within the survey area.
<i>Thelymitra stellata</i>	Threatened: Endangered	Threatened	Tuberous, terrestrial orchid to 0.25 m tall. Flowers yellow and brown, visible from October to November. Habitat for this species is sand, gravel and lateritic loam substrate (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Trithuria occidentalis</i>	Threatened: Endangered	Threatened	Sokoloff <i>et al.</i> (2008) describes <i>Trithuria occidentalis</i> as having fruits with a maximum width in their distal part; dry mature fruits that dehisce by separating three longitudinal ribs; dry mature seeds clearly sculptured. Habitat for this species is within very open shrubland of <i>Melaleuca lateritia</i> , partly submerged on the edge of shallow, winter-wet claypans. <i>Trithuria occidentalis</i> is currently known from one confirmed location near Ellenbrook. There is also a possible second location in Upper Swan in which the species has not been recorded since 1978 (Sokoloff <i>et al.</i> 2008).	Possible – Preferred habitat may occur within the survey area.
<i>Acacia anomala</i>	Threatened: Vulnerable	Threatened	<i>Acacia anomala</i> grows over laterite in shallow sand, loam, clay or gravel on ridges, slopes and low plains, entangled amongst other low shrubs in dense vegetation. The species grows in low open woodland or forest dominated by <i>Eucalyptus marginata</i> , <i>E. wandoo</i> , <i>E. accedens</i> and <i>Corymbia calophylla</i> . Understorey heath is dominated by <i>Grevillea</i> , <i>Dryandra</i> , <i>Hakea</i> and <i>Acacia</i> species (DEE 2016d).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Acacia aphylla</i>	Threatened: Vulnerable	Threatened	This species is largely associated with laterite and granite outcrops on hillsides. Individuals may grow in rock crevices. Soils may be sand, loam, clay or gravel; brown or yellow in colour (DEE 2016d).	Unlikely – Preferred habitat unlikely to occur within the survey area.

Species	Conservation status		Description	Potential to occur
	EPBC Act	WC Act		
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	Threatened: Vulnerable	Threatened	A rhizomatous perennial herb from 0.05 m to 0.2 m tall. Flowers are green/yellow-green and visible from August to September. Habitat for this species is grey sand and clay loam substrate, in winter-wet depressions (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Conospermum undulatum</i>	Threatened: Vulnerable	Threatened	Erect compact shrub from 0.6 m to 2.0 m high. Flowers are white and visible May to October. Habitat for this species is grey or yellow-orange clayey substrate (Western Australian Herbarium 1998-).	Possible – Preferred habitat may occur within the survey area.
<i>Diuris micrantha</i>	Threatened: Vulnerable	Threatened	A slender orchid to 60 cm tall. Yellow flowers with reddish-brown markings measuring 1.3 cm across. Habitat for this species occurs within clay-loam substrates in winter-wet depressions or swamps (DEE 2016d). <i>Diuris micrantha</i> is known from four locations (Collie, Yalgorup, Manjimup and Perth) and grows in swamps, drainage lines and seasonally inundated flats in clay soils (DEE 2016d).	Possible – Preferred habitat may occur within the survey area.
<i>Drakaea micrantha</i>	Threatened: Vulnerable	Threatened	A tuberous, terrestrial orchid to 30 cm tall. Silvery-grey heart shaped leaf with prominent green veins. Red and yellow singular flower. Habitat for this species occurs within cleared, open sandy patches (Brown <i>et al.</i> 1998).	Possible – Preferred habitat may occur within the survey area.
<i>Diplolaena andrewsii</i>	Not listed	Threatened	An erect shrub to 1 m tall. The inner involucre bracts are glabrous and leaves broadly cordate. Flowers are red and visible July to October. Habitat for this species is loam or clay substrate on granite outcrops & hillsides (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Synaphea</i> sp. Pinjarra Plain	Not listed	Threatened	Erect clumped shrub to 80 cm high. Flowers are yellow and visible from September to November. This species preferred substrates are grey sandy loam or clay, grey-brown clayey sand, brown clayey loam or laterite (Western Australian Herbarium 1998-). The species prefers seasonally wet areas and railroad reserves, with wet depressions or drains (Western Australian Herbarium 1998-).	Possible – Preferred habitat may occur within the survey area.
<i>Bolboschoenus medianus</i>	Not listed	Priority 1	A rhizomatous perennial sedge, grass-like or herb with red-brown flowers. Habitat for this species is in mud, water and on river banks (Western Australian Herbarium 1998-).	Possible – Preferred habitat may occur within the survey area.
<i>Hydrocotyle striata</i>	Not listed	Priority 1	An aquatic herb. Habitat for this species is clay substrate in springs (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Grevillea bipinnatifida</i> subsp. <i>pagna</i>	Not listed	Priority 1	A prostrate, lignotuberous shrub form 20-70 cm tall. Flowers are red/orange/yellow and visible from August to October and occasionally November. Habitat for this species occurs in seasonal wetlands, swamps and roadsides on grey sandy clay and loam as well as ironstone (Western Australian Herbarium 1998-).	Possible – Preferred habitat may occur within the survey area.
<i>Lepyrodiola curvescens</i>	Not listed	Priority 2	A dioecious, shortly creeping, tufted, rhizomatous herb between 20-40 cm tall. Flowers visible from September to November. Habitat for this species occurs on sand or laterite in seasonally inundated swamplands (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Phyllangium palustre</i>	Not listed	Priority 2	An erect succulent annual herb to 2 cm high. Flowers are white and visible October to November. Habitat for this species is clay substrate in winter-wet claypans and low-lying seasonal wetlands (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.

Species	Conservation status		Description	Potential to occur
	EPBC Act	WC Act		
<i>Thelymitra variegata</i>	Not listed	Priority 2	A tuberous, perennial orchid from 10-35 cm tall. Flowers are a mixture of purple, orange, red and pink and visible between June-September. Habitat for this species occurs on sandy clay, sand and laterite (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Acacia drummondii</i> subsp. <i>affinis</i>	Not listed	Priority 3	An erect shrub, 0.3-1 m high. Flowers are yellow, and visible from July to August. This species occurs on lateritic gravelly soils (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>	Not listed	Priority 3	A shrub to 2.5 m tall. Has 'minni-ritchi' bark, with phylloides mostly 8-13 cm long, and 1-2 mm wide. Flowers are yellow and visible August to October. Habitat for this species is restricted to granitic soils (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Acacia ridleyana</i>	Not listed	Priority 3	A spreading, sprawling shrub from 20 cm to 90 cm tall and up to 2 m wide. Flowers are yellow and visible from August to December. Habitat for this species is grey or yellow/brown sand, gravelly clay, or granitic loam substrate (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Beaufortia purpurea</i>	Not listed	Priority 3	An erect or spreading shrub from 30 cm to 1.5 m high. Flowers are red-purple and visible October to December, or January to February. Habitat for this species is lateritic or granitic soils on rocky slopes (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Byblis gigantea</i>	Not listed	Priority 3	A small, branched perennial, herb (or sub-shrub), to 45 cm tall. Flowers are pink-purple/white and visible September to December or January. Habitat for this species is within sandy-peat swamps and seasonally inundated areas (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Carex tereticaulis</i>	Not listed	Priority 3	A monococious, rhizomatous, tufted perennial sedge, grass-like or herb, to 70 cm tall. Flowers are brown and visible September through to October. Habitat for this species substrate of black peaty sand (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Eryngium</i> sp. <i>subdecumbens</i>	Not listed	Priority 3	No information available.	Uncertain – lack of information available.
<i>Halganina corymbosa</i>	Not listed	Priority 3	An erect shrub, from 35 to 100 cm tall. Flowers are blue-purple, occurring from August to November. Habitat for this species occurs on gravelly soils and soils over granite (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Isopogon drummondii</i>	Not listed	Priority 3	An erect lignotuberous shrub to 1 m tall. Flowers are yellow/cream-yellow and visible February to June. Habitat for this species is white, grey or yellow sand, often over laterite (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Lasiopetalum glutinosum</i> subsp. <i>glutinosum</i>	Not listed	Priority 3	Shepherd and Wilkins (2015) describe <i>Lasiopetalum glutinosum</i> subsp. <i>glutinosum</i> as a multi-stemmed, spreading, viscid, subshrub to shrub, from 0.2 m to 1 m tall and 0.2 m to 1.5 m wide. Flowers are pink/purple visible from September to December. Habitat for this species is open woodland dominated by combinations of <i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> , <i>Banksia menziesii</i> and <i>B. attenuata</i> . Also occur in open, low scrub over heath, on steep slopes of lateritic gravel, clay or sandy loam near granite outcrops and creeklines.	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Meionectes tenuifolia</i>	Not listed	Priority 3	No habitat information available for this species.	Uncertain – lack of information available.
<i>Myriophyllum echinatum</i>	Not listed	Priority 3	An erect annual herb, 2-3 cm tall. Flowers are red, occurring in November. Habitat for this species includes clay soil on winter-wet flats (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.

Species	Conservation status		Description	Potential to occur
	EPBC Act	WC Act		
<i>Pithocarpa corymbulosa</i>	Not listed	Priority 3	An erect to scrambling perennial herb 50 to 100 cm tall. Flowers are white and are present from January to April. Habitat for this species occurs within gravelly or sandy loam and amongst granite outcrops (Western Australian Herbarium 1998-, DoE 2015e).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Boronia tenuis</i>	Not listed	Priority 4	A procumbent or erect and slender shrub between 10-50 cm tall. Flowers are blue/pink-white and visible from August to November. Habitat for this species occurs on laterite, stony soils and granite (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Calothamnus accedens</i>	Not listed	Priority 4	An erect and slender shrub to 1.8 m tall. Habitat for this species occurs on sandy soils over laterite and the species has been recorded from road verges.	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Darwinia pimelioides</i>	Not listed	Priority 4	An erect shrub to 50 cm tall. Flowers are red/pink and green, visible from September to October. Habitat for this species is loam and sandy loam in granite outcrops (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Gastrolobium stipulare</i>	Not listed	Priority 4	An erect, leafy shrub to 50 cm tall. Flowers are yellow/red/brown and visible in September. Habitat for this species occurs on yellow-grey sand, gravelly clay loam and laterite on slopes and ridges (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Hibbertia montana</i>	Not listed	Priority 4	An erect, straggling or sprawling shrub between 10 cm to 70 cm tall. Flowers are yellow and visible from July to October. Habitat for this species occurs in a variety of substrates including: loamy soils over granite, lateritic soils and gravel (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Hydrocotyle lemnoides</i>	Not listed	Priority 4	An aquatic floating annual herb. Flowers are purple and visible August to October. Habitat for this species is localised to swamps (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Jacksonia sericea</i>	Not listed	Priority 4	Low spreading shrub to 60 cm tall. Flowers are orange and visible December or January or February. Habitat for this species is calcareous and sandy soils (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Lasiopetalum bracteatum</i>	Not listed	Priority 4	An erect, open shrub between 0.4-1.5 m tall. Flowers are pink-purple and visible from August to November. Habitat for this species occurs on sandy clay to clay soils or lateritic gravel along drainage lines, creeks, gullies and granite outcrops (Western Australian Herbarium 1998-).	Possible – Preferred habitat may occur within the survey area.
<i>Schoenus griffinianus</i>	Not listed	Priority 4	A small, tufted, perennial sedge to 10 cm tall. Flowers are visible in September-October. Habitat for this species is on white sand (Western Australian Herbarium 1998-).	Possible – Preferred habitat may occur within the survey area.
<i>Senecio leucoglossus</i>	Not listed	Priority 4	An erect annual herb to 1.3 m tall. Flowers are white and visible from August to December. Habitat for this species is gravelly lateritic or granitic soil substrates over granite outcrops on slopes (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Stylidium longitubum</i>	Not listed	Priority 4	Erect annual (ephemeral) herb to 12 cm tall. Flowers are pink and visible October to December. Habitat for this species is sandy clay or clay substrates in seasonal wetlands (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.
<i>Thysanotus glaucus</i>	Not listed	Priority 4	A caespitose, glaucous perennial, herb, to 20 cm tall. Flowers are purple and visible October to December, or from January to March. Habitat for this species is white, grey or yellow sand, or sandy gravel substrate (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.

Species	Conservation status		Description	Potential to occur
	EPBC Act	WC Act		
<i>Vericordia lindleyi</i> subsp. <i>lindleyi</i>	Not listed	Priority 4	An erect shrub, 20 to 75 cm tall. Flowers are pink and occur in May or November to December or January. Habitat for this species occurs in sand and sandy clay within winter-wet depressions (Western Australian Herbarium 1998-).	Unlikely – Preferred habitat unlikely to occur within the survey area.

Threatened and Priority Ecological Communities

A TEC is defined under the EP Act as an ecological community listed, designated or declared under a written law or a law of the Australian Government as Threatened, Endangered or Vulnerable. There are four State categories of TECs (DEC 2010)¹:

- presumed totally destroyed (PD)
- critically endangered (CR)
- endangered (EN)
- vulnerable (VU).

A description of each of these TEC categories is presented in Appendix 4. TECs are gazetted as such (Parks and Wildlife 2015a) and some Western Australian TECs listed by Parks and Wildlife (2015c) are also listed as Threatened under the EPBC Act.

Under the EPBC Act, a person must not undertake an action that has or will have a significant impact on a listed TEC without approval from the Australian Government Minister for the Environment, unless those actions are not prohibited under the EPBC Act. A description of each of these categories of TECs is presented in Appendix 4. The current EPBC Act list of TECs can be located on the DEE website (DEE 2016e).

Ecological communities identified as Threatened, but not listed as TECs, are classified by the State as Priority Ecological Communities (PECs). These communities are under threat, but there is insufficient information available concerning their distribution to make a proper evaluation of their conservation status. Parks and Wildlife categorises PECs according to their conservation priority, using five categories, P1 (highest conservation significance) to P5 (lowest conservation significance), to denote the conservation priority status of such ecological communities. Appendix 4 defines PECs (DEC 2010). Parks and Wildlife (2016) contains a list of current PECs.

Four TECs and one PEC were identified within 5 km of the survey area as depicted in Figure 5 and listed below:

- SCP20c (TEC: Critically Endangered – EPBC Act)
- SCP07 (TEC: Critically Endangered – EPBC Act)
- SCP20a (TEC: Endangered – EPBC Act)
- SCP20b (TEC: Endangered – EPBC Act)
- SCP21c (PEC: P3).

The potential areas of occurrence of all identified communities are located greater than 800 m from the survey area.

Wetlands

The survey area intersects a mapped geomorphic Conservation Category Wetland associated with the Helena River (Figure 6). Vegetation within the survey area is representative of wetland (riparian) vegetation, albeit in a highly degraded state due to modification of vegetation structure and clearing associated with historical land uses and adjacent urban areas.

Bush Forever

There are no Bush Forever sites within or adjacent to the survey area.

¹ The Department of Environment and Conservation is still listed as the author of all TEC and PEC databases and have been referred to as such in this document instead of the Department of Parks and Wildlife (Parks and Wildlife).

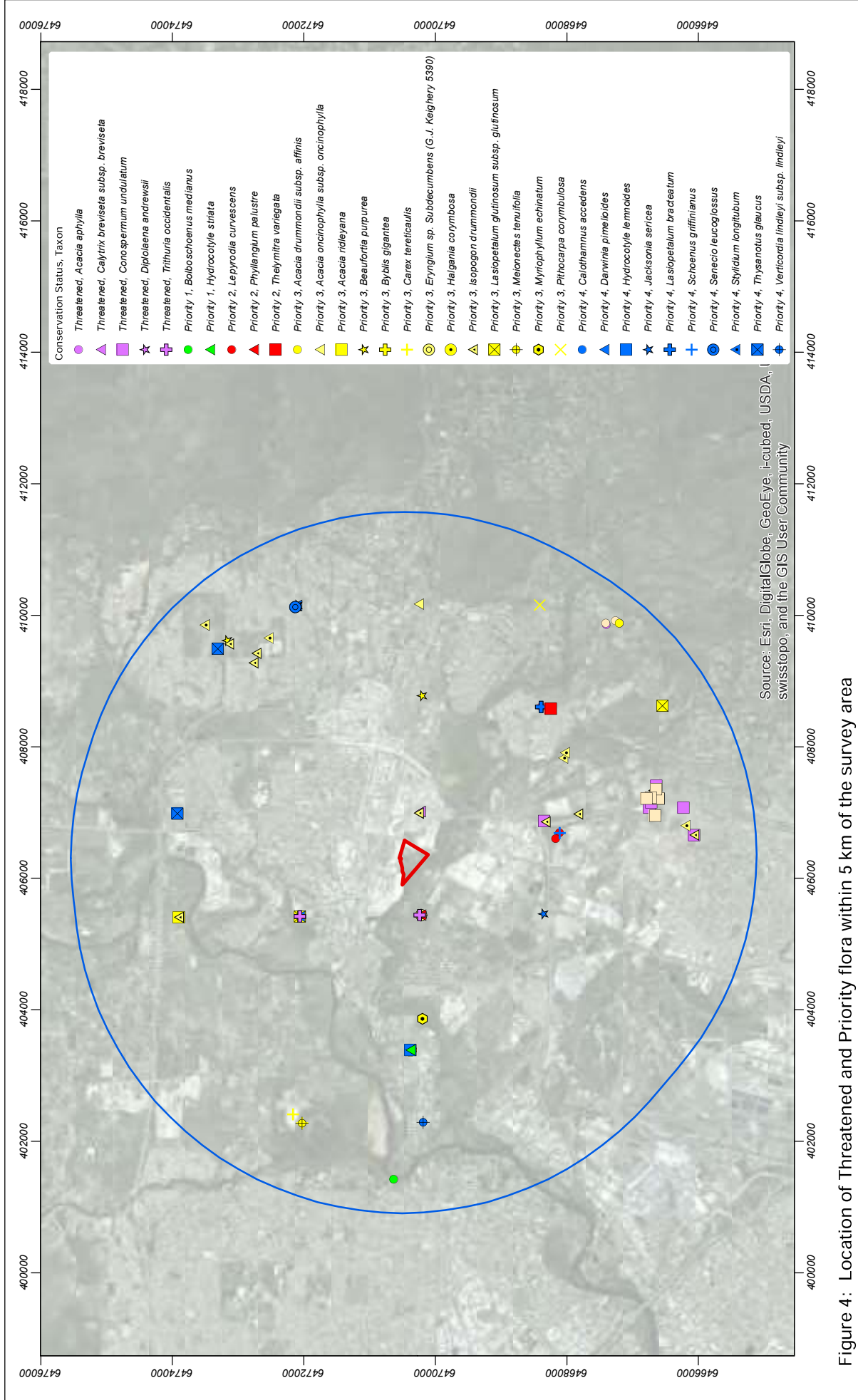


Figure 4: Location of Threatened and Priority flora within 5 km of the survey area

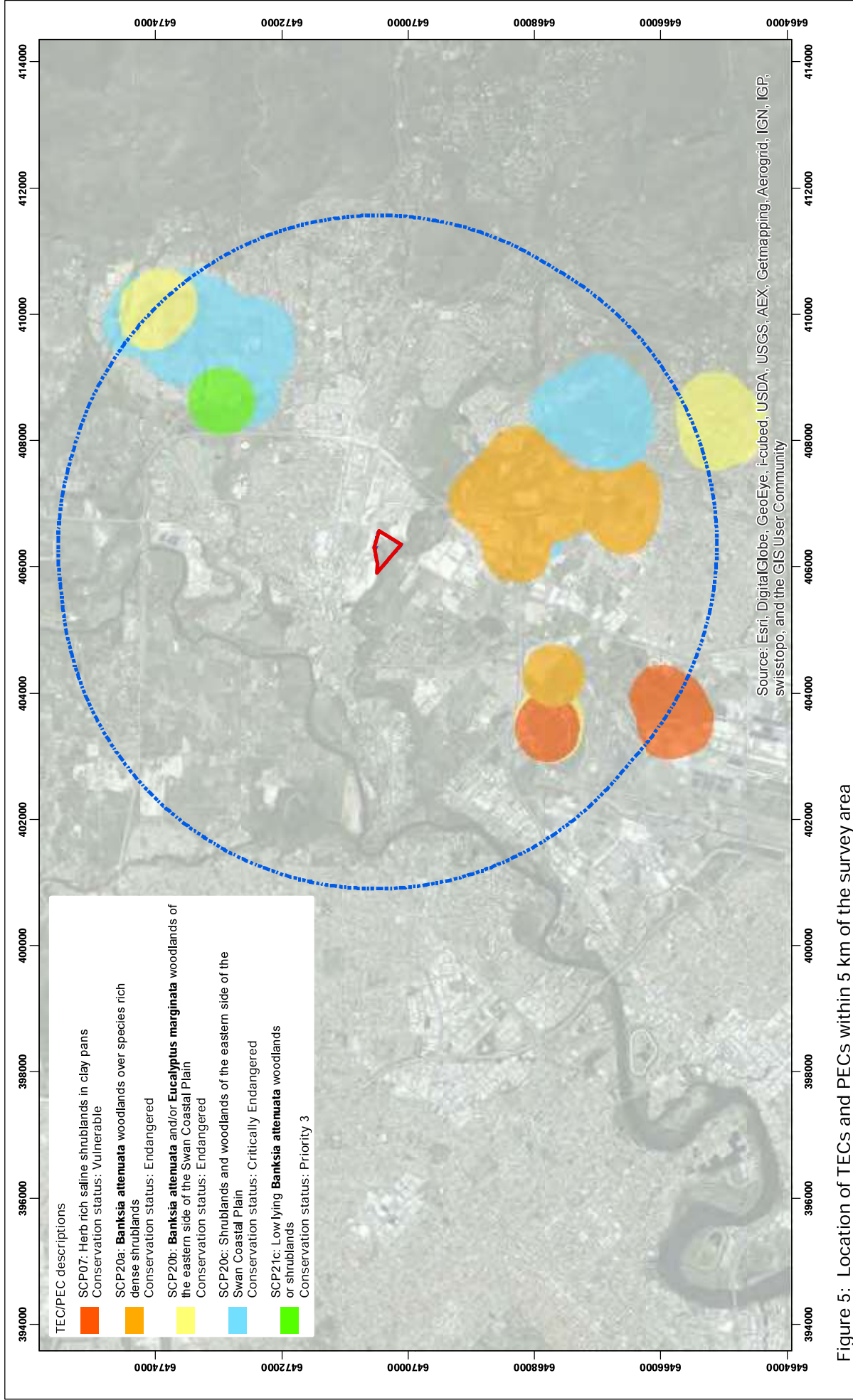


Figure 5: Location of TECs and PECs within 5 km of the survey area



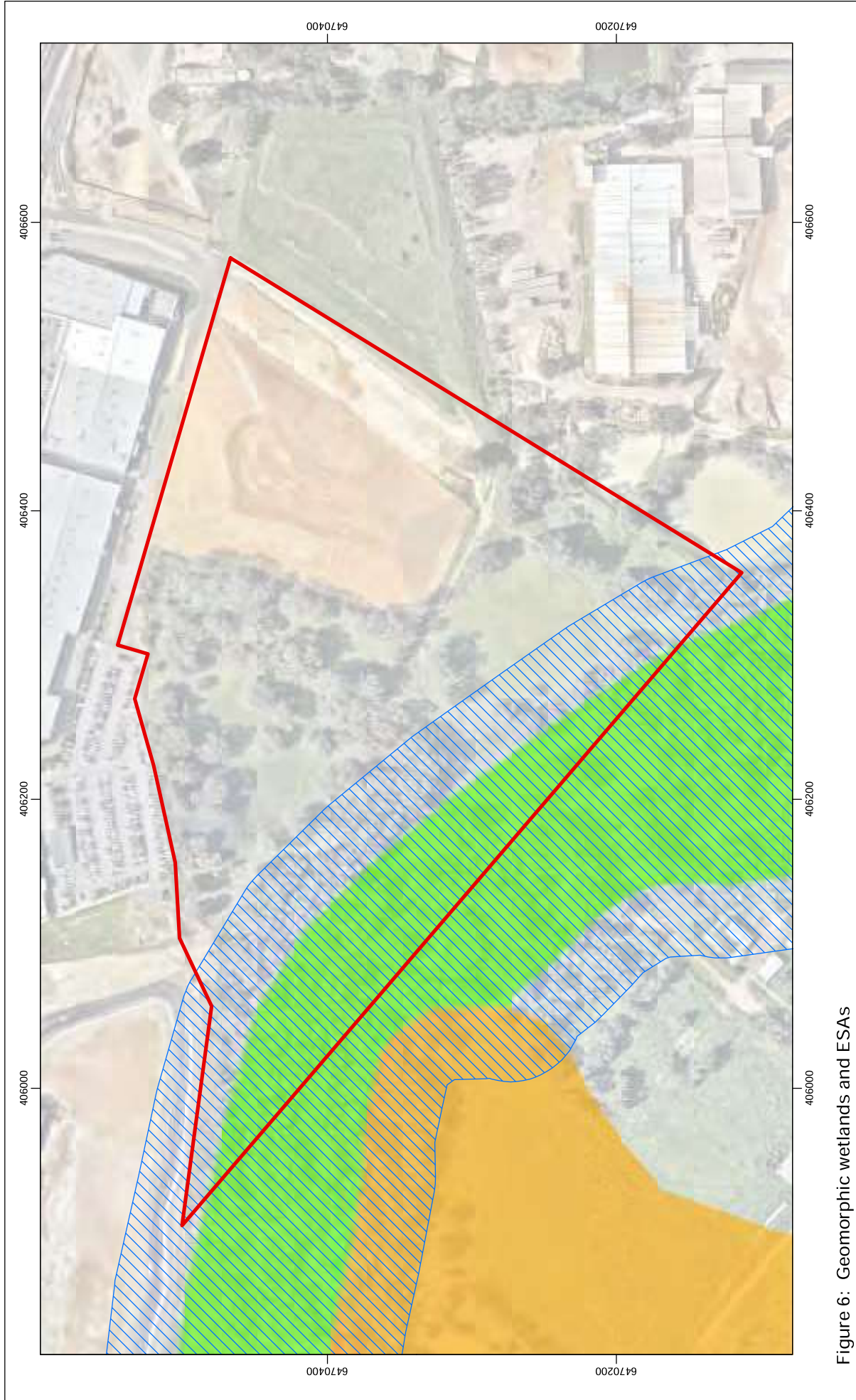


Figure 6: Geomorphic wetlands and ESAs

Scale 1:3 500 at A4

0 20 40 60 80 100 Meters

Coordinate System: GDA 1984 MGA Zone 50
Note that positional errors may occur in some areas
Date: 29/09/2016
Author: DWWhite
Source: Aerial; Nearmaps July 2016; Wetlands: DPaW 2016; ESAs: DER 2016.
Path: Q:\Consult\2015\MRAMRA15121\ArcMap_documents\MRA15121_07_R001_RevA_F006.mxd

Legend

Survey area Geomorphic wetland categories

ESA Conservation Multiple Use

strategen
www.strategen.com.au

4.1.2 Field survey results

Native flora

A total of six native vascular plant taxa from five plant genera and five plant families were recorded within the survey area (Appendix 1). The relatively low number of species recorded and lack of annual species reflects the highly disturbed nature of the survey area.

Threatened and Priority flora

No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Schedule 1 of the WC Act and as listed by Parks and Wildlife (2015b) were recorded within the survey area. Additionally, no Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the survey area.

It should be noted that due to the time of survey (i.e. outside of the prime flowering period for species in the south-west of Western Australia), a full targeted Threatened and Priority flora survey was not undertaken. However, given the extremely degraded nature of vegetation within the survey area; no conservation significant species are inferred to occur.

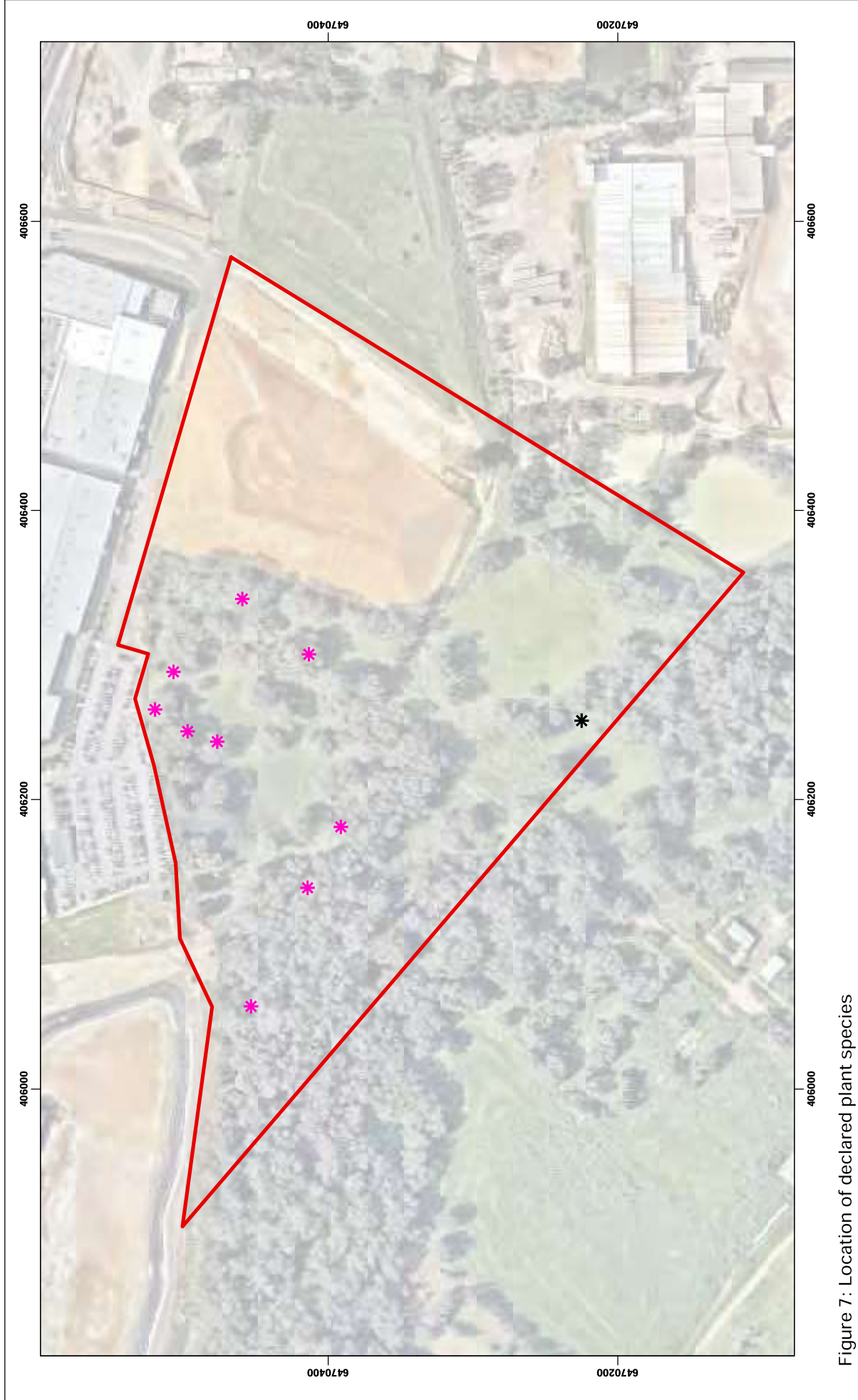
Introduced (exotic) taxa

A total of 14 introduced (exotic) taxa were recorded within the survey area (Appendix 1).

Two of these species (**Gomphocarpus fruticosus* [Narrow leaf Cottonbush] and **Solanum linnaeanum* [Apple of Sodom]) are Declared Plant species in Western Australia pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) according to the Western Australian Department of Agriculture and Food (DAFWA 2016). Narrow leaf Cottonbush was observed in high densities at multiple locations within the survey area and Apple of Sodom was observed in only one location within the survey area (Table 4; Figure 7).

Table 4: Locations of Declared Plant species pursuant to section 22 of the BAM Act recorded within the survey area

Species	GPS location (GDA 94)	
	Easting	Northing
<i>*Gomphocarpus fruticosus</i>	406181	6470391
	406139	6470414
	406057	6470453
	406262	6470520
	406288	6470507
	406339	6470459
	406300	6470413
	406240	6470477
	406247	6470497
<i>*Solanum linnaeanum</i>	406254	6470225



Vegetation types

Two vegetation types (VTs) were defined and mapped within the survey area (Appendix 1; Figure 8) and are summarised in Table 5. Total areas occupied within the survey area by each of the identified VTs are set out in Table 6.

Table 5: Vegetation Types

Vegetation Type	Description
1	<i>Eucalyptus rudis</i> and <i>*Ficus carica</i> woodland over <i>*Ricinus communis</i> tall shrubland over <i>*Typha orientalis</i> sedgeland or <i>*Ehrharta calycina</i> and Poaceae sp. open bunch grassland over <i>*Oxalis pes-caprae</i> low herbland on sandy, clay-loam soils.
2	<i>*Ehrharta calycina</i> and <i>*Cenchrus setaceus</i> open bunch grassland over <i>*Oxalis pes-caprae</i> herbland with scattered native and exotic trees and shrubs.
C	Cleared areas.

Vegetation type coverage

The total area mapped within the survey area was 13.65 ha which includes fully cleared areas (Table 6). The dominant native VT within the survey area was VT 1 which can be broadly described as; *Eucalyptus rudis* and **Ficus carica* woodland over mixed weeds.

Table 6: Area (ha) covered by each VT within the survey area

VT	Area (ha)	Percentage of the survey area
1	7.35	53.84
2	2.23	16.34
C	4.07	29.82
TOTAL	13.65	100.00

Vegetation condition

The survey area shows signs of having been degraded for a long period of time. Historical land uses within the survey area and neighbouring properties are likely to have contributed to the level of weed infestation within the survey area and modification to vegetation structure in areas. Consequently, vegetation condition within the entire survey area (i.e. 13.65 ha) was rated as Completely Degraded (Keighery 1994; Figure 8; Table 7).

Table 7: Vegetation condition scale (Keighery 1994)

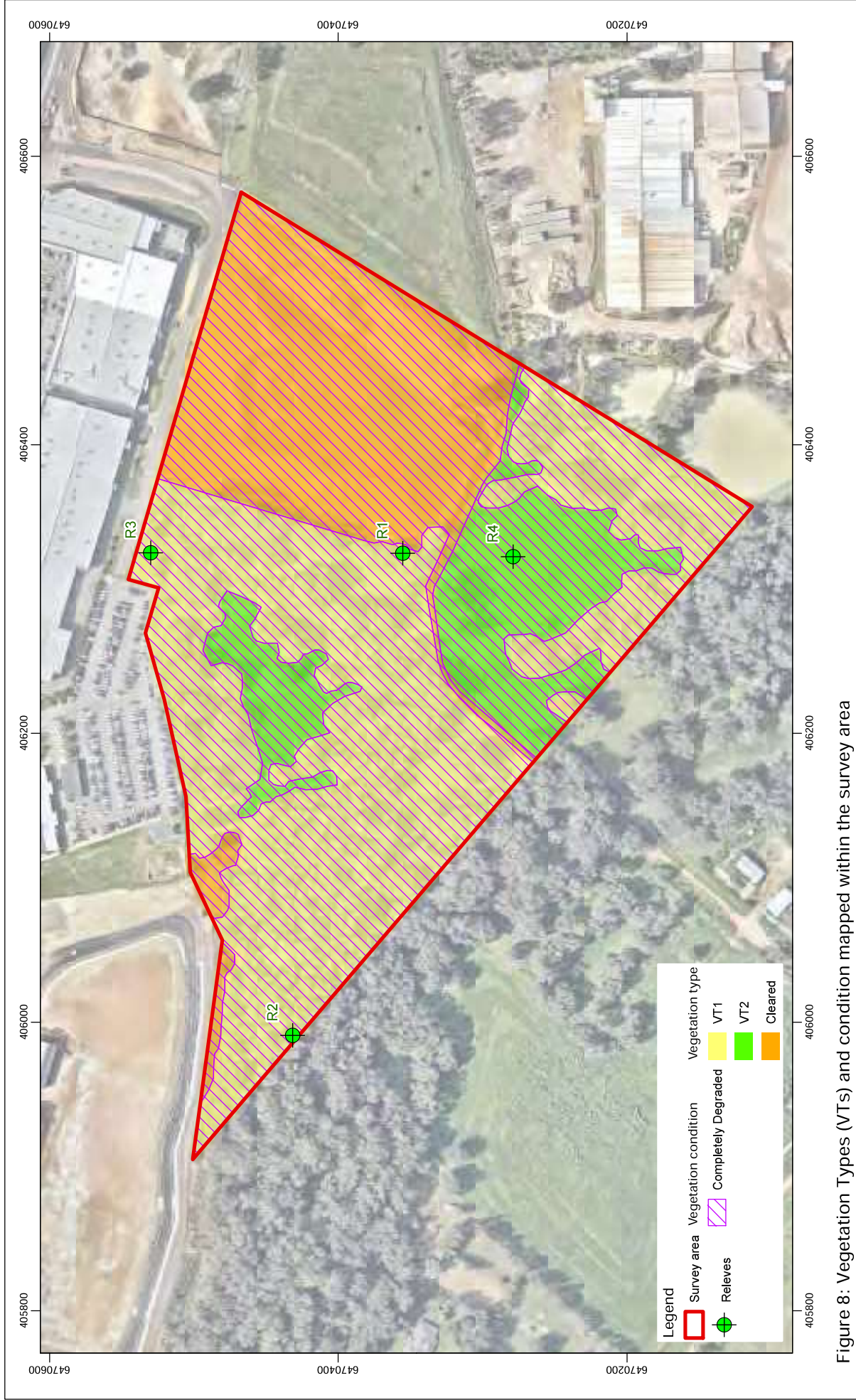
Condition rating	Description
Pristine (1)	Pristine or nearly so, no obvious sign of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by obvious signs of multiple disturbances. 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, grazing.
Degraded (5)	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 (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

4.1.3 Threatened and Priority Ecological Communities

Four TECs and one PEC were identified within 5 km of the survey area by the desktop survey as depicted in Figure 5 and listed below:

- SCP20c (TEC: Critically Endangered – EPBC Act)
- SCP07 (TEC: Critically Endangered – EPBC Act)
- SCP20a (TEC: Endangered – EPBC Act)
- SCP20b (TEC: Endangered – EPBC Act)
- SCP21c (PEC: P3).

The highly degraded nature of the survey area makes a comparison between mapped VTs and known TECs and PECs impossible. The level of degradation within the survey area and absence of all but a few native species leads to the inference that no TECs or PECs occur within the survey area.



4.2 Black cockatoo habitat

4.2.1 Black cockatoo presence

No black cockatoos were sighted within the survey area during the assessment on 18 August 2016.

4.2.2 Foraging assessment

The survey area was divided into two different vegetation types, as outlined in Section 4.1.2. Both VTs contain flora species which are considered to be utilised by CBC for foraging; thus 9.58 ha of potential foraging habitat for CBC exists within the survey area (Groom 2011, Johnstone 2010a, Johnstone *et al.* 2011). No foraging habitat for FRTBC or BBC exists within the survey area.

Foraging habitat for black cockatoos is generally defined as the availability of plant food sources within an area (Finn 2012). Food availability for black-cockatoos is a function of the diversity, abundance, distribution, energetic and nutritional qualities, and seasonality (phenology) of the food sources within a particular area. Table 8 summarises the value of each VT in terms of the quality of foraging habitat provided for black cockatoos. Table 9 provides a justification for how foraging values were defined.

Foraging habitat quality is displayed in Figure 9. Both VTs contained the same foraging species for CBC (*Eucalyptus rudis* and *Ficus carica*); however, the density of suitable foraging species was significantly higher in VT 1 than VT 2.

Based on the results of the foraging assessment, the survey area is considered to contain 7.35 ha of moderate-good quality foraging habitat and 2.23 ha of very poor quality foraging habitat for CBC only.

No signs of black cockatoo foraging were observed in the survey area.

Table 8: Vegetation types and black cockatoo foraging species within the survey area

Vegetation type	Black cockatoo foraging species	Foraging quality	Area (ha)
1	CBC – <i>Eucalyptus rudis</i> . FRTBC – Nil. BBC – Nil.	<ul style="list-style-type: none"> Moderate - Good (CBC) Nil (FRTBC) Nil (FRTBC) 	7.35
2	CBC – <i>Eucalyptus rudis</i> . FRTBC – Nil. BBC – Nil.	<ul style="list-style-type: none"> Very poor (CBC) Nil (FRTBC) Nil (FRTBC) 	2.23

Table 9: Definition of black cockatoo foraging habitat within the survey area

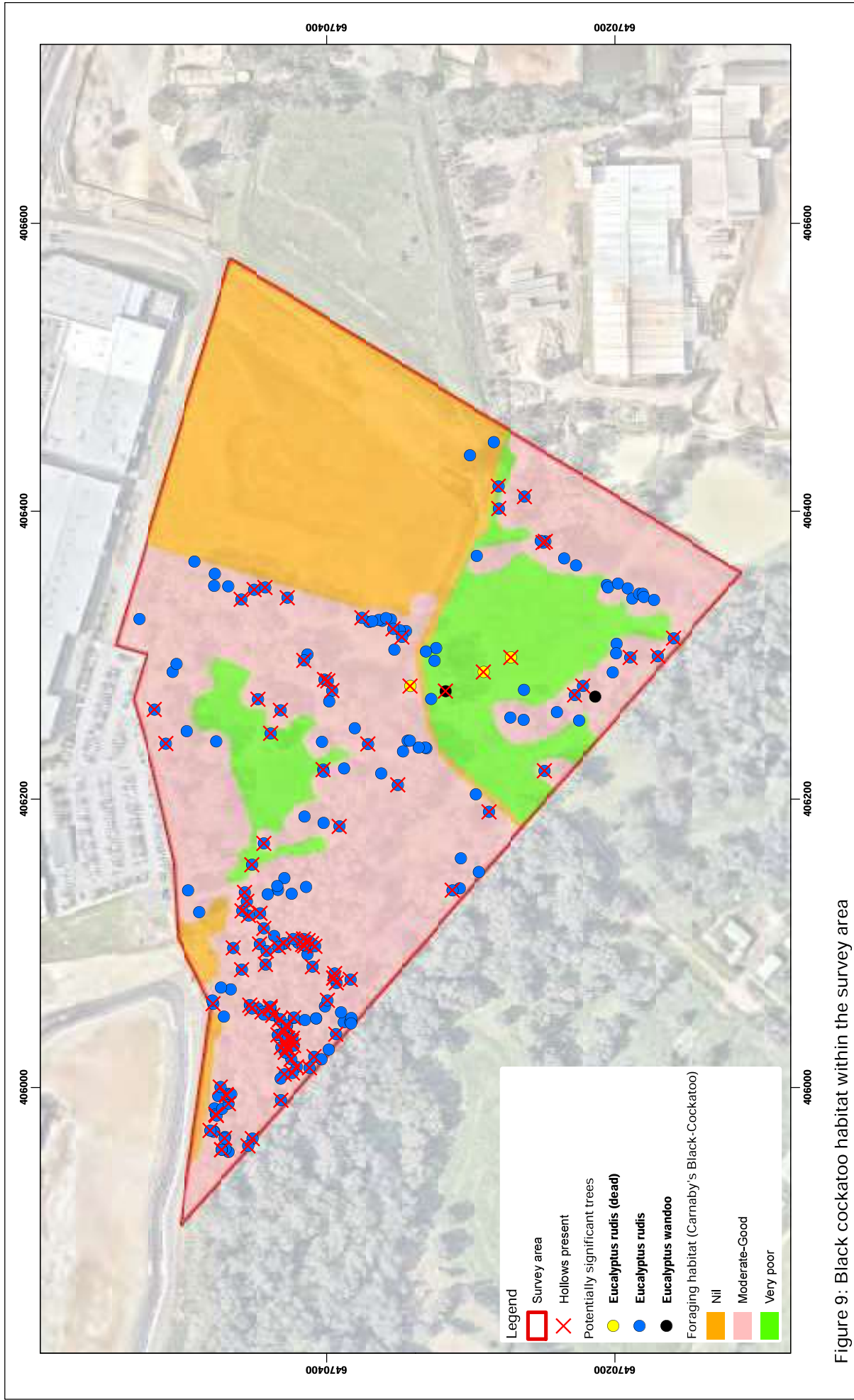
Foraging quality	Justification
Excellent	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) and presence of food sources at several strata (i.e. canopy, midstorey and understorey).
Good	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) but food sources only present at one or two strata (i.e. canopy and midstorey).
Moderate	Moderate foraging value density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 20-40%) and food sources only present at one or two strata (i.e. canopy and midstorey).
Poor	Low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 10-20%) and presence of food sources at only one stratum (i.e. canopy).
Very poor	Very low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species <10%) and presence of food sources at only one stratum (i.e. canopy).
Nil	Cleared areas - no suitable vegetation present.

4.2.3 Significant tree assessment

Breeding habitat' for black cockatoos is defined in DSEWPac (2012) as trees of species known to support breeding (Table 2) within the range of the species which either have a suitable nest hollow or are of a suitable DBH to develop a nest hollow (> 300 mm for salmon gum and wandoo, and >500 mm for other species). These trees are known as significant trees. Trees of this size may also be large enough to provide roosting habitat (i.e. trees which provide a roost or rest area for the birds). Significant trees which contain hollows that have an entrance diameter of more than 100 mm are suitable for use by black cockatoos (Whitford and Williams 2002). In general, hollows of sufficient size to support black-cockatoos do not form until trees are at least 230 years old, and the majority of nests are found in 300-500 year old trees (Johnstone 2006).

The only tree species potentially utilised by black cockatoos for roosting and/or breeding within the survey area is *Eucalyptus rudis*; which is only known to be used by CBC for these purposes and therefore does not represent habitat for BBC and FRBC (Johnstone *et al.* 2011). A total of 220 potentially significant *E. rudis* trees (with DBH >500 mm) were recorded in the survey area (Figure 9). All of these trees have the potential to be used as roosting habitat for CBC. 109 of these trees contained a hollow of sufficient size to be utilised by CBC for breeding purposes, however, given the location of these trees is outside of the known breeding range for CBC, it is highly unlikely that they provide breeding habitat for black cockatoos.

The significant tree assessment applies to roosting habitat for CBC only.



5. Discussion

Vegetation within the survey area comprises 2 VTs and cleared areas. Transitions between VTs were generally abrupt as a result of historical clearing. At a broad scale, the entire survey area was observed to be in various states of degradation due to nearby urban land uses and historical clearing within the survey area.

The flora and vegetation assessment conducted within the survey area was undertaken during August 2016, outside of the typical prime flowering time for majority of species within the area. Notwithstanding the above, the methodology applied to the survey area is consistent with the requirements of a Level 1 flora and vegetation survey as specified in GS 51.

The number of native and exotic species recorded on the survey area totalled 6 native vascular plant taxa and 14 introduced taxa. Two Declared Plant species pursuant to section 22 of the BAM Act (**Gomphocarpus fruticosus* [Narrow leaf Cottonbush] and **Solanum linnaeanum* [Apple of Sodom]) were recorded within the survey area (DAFWA 2016).

No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Schedule 1 of the WC Act and as listed by Parks and Wildlife (2015) were recorded within the survey area. Additionally, no Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the survey area. Given that the highly degraded nature of vegetation within the survey area; it is highly unlikely that any conservation significant species are contained within.

Vegetation condition within the entire survey area was Completely Degraded. This is largely attributable to historical clearing and adjacent urban land uses.

The highly degraded and modified nature of the survey area does not allow for a comparison between mapped VTs and known TECs and PECs. Given the extremely low diversity of native species present within the survey area; it can be reasonably assumed that no TECs or PECs occur within.

The survey area is considered to contain 7.35 ha of moderate-good and 2.23 ha of very poor quality foraging habitat for CBC. No suitable foraging habitat for FRTBC or BBC was identified within the survey area.

A total of 220 potentially significant trees were recorded within the survey area. The only tree species potentially utilised by black cockatoos for roosting and breeding within the survey area is *Eucalyptus rudis*; which is only known to be used by CBC for these purposes and therefore does not represent habitat for BBC and FRBC. 109 of these trees contain hollows which are of suitable size for use by black cockatoos for breeding, however, given the location of these trees is outside of the known breeding range for CBC it is unlikely that any of these trees would be utilised by black cockatoos for breeding purposes.

The black cockatoo habitat value of the survey area is therefore restricted to one of the three species, CBC, and is comprised of the following:

- 7.35 ha of moderate-good and 2.23 ha of very poor quality foraging habitat
- 220 potential roosting trees.

6. Conclusion

The Level 1 flora and vegetation survey (conducted 18 August 2016) has been successful in collecting data to define and assess the presence, extent and significance of vegetation types within the survey area.

Vegetation within the survey area meets the definition of riparian vegetation and therefore does not qualify for certain exemptions to the requirement for a Native Vegetation Clearing Permit, however can still be cleared provided a permit is granted by the Department of Environment Regulation (DER). The highly degraded nature of vegetation within the survey area is unlikely to support conservation significant flora species or vegetation communities and therefore it is considered that no follow-up flora and vegetation surveys are required.

Although the site contains suitable foraging and roosting habitat for CBC; no evidence of foraging was observed and no black cockatoos were sighted within the survey area at the time of the assessment. An impact assessment is recommended once final project designs are known to determine how many (if any) of the trees within the survey area with the potential to be used for roosting purposes by black cockatoos will be cleared, and consequently if the project needs to be referred to the Commonwealth Department of Environment and Energy (DEE).

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Appendix 1
Vascular plant taxa recorded within the
survey area

Family	Species
Anacardiaceae	* <i>Schinus molle</i>
Euphorbiaceae	* <i>Ricinus communis</i>
Fabaceae	<i>Acacia saligna</i>
	* <i>Lupinus angustifolius</i>
	* <i>Trifolium angustifolius</i>
Juncaceae	<i>Juncus kraussii</i>
Moraceae	* <i>Ficus carica</i>
Myrtaceae	<i>Eucalyptus rudis</i>
	<i>Eucalyptus wandoo</i>
	<i>Melaleuca preissiana</i>
Oxalidaceae	* <i>Oxalis pes-caprae</i>
Poaceae	* <i>Arundo donax</i>
	* <i>Ehrharta calycina</i>
	* <i>Pennisetum setaceum</i>
	*Poaceae sp.
Proteaceae	<i>Adenanthos cygnorum</i>
Rosaceae	* <i>Rubus fruticosus</i>
Solanaceae	* <i>Solanum linnaeanum</i>
	* <i>Solanum nigrum</i>
Typhaceae	* <i>Typha orientalis</i>

* denotes exotic species

Appendix 2
Photographic record of vegetation
types



VT1: *Eucalyptus rudis* and *Ficus carica* woodland over *Ricinus communis* tall shrubland over *Typha orientalis* sedgeland or *Ehrharta calycina* and Poaceae sp. open bunch grassland over *Oxalis pes-caprae* low herbland on sandy, clay-loam soils.



VT2: *Ehrharta calycina* and *Cenchrus setaceus* open bunch grassland over *Oxalis pes-caprae* herbland with scattered native and exotic trees and shrubs.

Appendix 3
Desktop assessment results (Parks and
Wildlife 2007-, DEE 2016b)

MRA15121.07 Naturemap

Created By Daniel Panickar on 25/08/2016

Kingdom	Plantae
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	116° 00' 30" E, 31° 53' 53" S
Buffer	3km
Group By	Family

Family	Species	Records
Acrobolaceae	1	1
Amaranthaceae	7	18
Anarthriaceae	2	7
Apiaceae	14	32
Araliaceae	6	12
Asparagaceae	18	38
Asteraceae	48	78
Boraginaceae	2	6
Boryaceae	2	4
Brassicaceae	2	2
Byblidaceae	1	3
Campanulaceae	10	24
Caryophyllaceae	3	3
Casuarinaceae	3	7
Celastraceae	2	3
Centrolepidaceae	7	13
Chenopodiaceae	3	3
Colchicaceae	4	5
Commelinaceae	1	3
Convolvulaceae	1	1
Crassulaceae	4	8
Cucurbitaceae	1	1
Cyperaceae	33	59
Dasygongonaceae	2	4
Dicranaceae	1	1
Dilleniaceae	11	18
Dioscoreaceae	1	2
Droseraceae	18	52
Elaeocarpaceae	2	7
Ericaceae	23	69
Euphorbiaceae	4	10
Fabaceae	84	209
Gentianaceae	2	2
Geraniaceae	3	4
Goodeniaceae	18	37
Haemodorumaceae	26	84
Haloragaceae	9	22
Hemerocallidaceae	7	17
Hydatellaceae	3	10
Hydrocharitaceae	3	3
Hypericaceae	2	4
Hypoxidaceae	2	3
Iridaceae	15	27
Juncaceae	4	7
Juncaginaceae	4	7
Lamiaceae	7	15
Lauraceae	1	1
Lentibulariaceae	4	7
Lepidoziaceae	1	1
Linaceae	2	2
Loganiaceae	4	8
Lythraceae	1	2
Malvaceae	5	21
Marsileaceae	1	1
Menyanthaceae	3	6
Molluginaceae	2	7
Myrtaceae	51	111
Oleaceae	1	1
Onagraceae	1	3
Orchidaceae	48	105
Oxalidaceae	5	9
Phrymaceae	1	1
Phyllanthaceae	3	4
Phytolaccaceae	1	1
Pittosporaceae	1	2
Plantaginaceae	3	4
Poaceae	39	45
Polygalaceae	3	3
Portulacaceae	1	1
Potamogetonaceae	1	4
Primulaceae	2	2
Proteaceae	58	188
Pteridaceae	2	4
Restionaceae	19	40
Rhamnaceae	6	13

Rosaceae	1	1
Rubiaceae	2	2
Rutaceae	4	11
Salicaceae	1	1
Santalaceae	1	2
Sapindaceae	3	4
Scrophulariaceae	1	2
Selaginellaceae	1	1
Solanaceae	3	4
Stylidiaceae	30	53
Thymelaeaceae	5	10
Typhaceae	1	1
Violaceae	1	3
Xanthorrhoeaceae	2	3
TOTAL	752	1640

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Acrobolbaceae				
1.	Goebelobryum unguiculatum			
Amaranthaceae				
2.	2716 Ptilotus declinatus (Curved Mulla Mulla)			
3.	2718 Ptilotus drummondii (Narrowleaf Mulla Mulla)			
4.	11260 Ptilotus drummondii var. drummondii (Pussytail)			
5.	11797 Ptilotus drummondii var. minor			
6.	2720 Ptilotus esquamatus			
7.	2742 Ptilotus manglesii (Pom Poms, Mulamula)			
8.	41001 Ptilotus nobilis subsp. nobilis (Yellow Tails)			
Anarthriaceae				
9.	1097 Lyginia barbata			
10.	18049 Lyginia imberbis			
Apiaceae				
11.	6205 Actinotus leucocephalus (Flannel Flower)			
12.	6209 Ammi majus (Bishop's Weed)	Y		
13.	12040 Apium prostratum var. prostratum (Sea Celery)			
14.	6214 Centella asiatica			
15.	6219 Eryngium pinnatifidum (Blue Devils)			
16.	Eryngium sp.			
17.	41810 Eryngium sp. Subdecumbens (G.J. Keighery 5390)		P3	
18.	6222 Homalosciadium homalocarpum			
19.	6249 Platysace compressa (Tapeworm Plant)			
20.	6253 Platysace filiformis			
21.	6255 Platysace juncea			
22.	6263 Schoenolaena juncea			
23.	6284 Xanthosia candida			
24.	6289 Xanthosia huegelii			
Araliaceae				
25.	6226 Hydrocotyle callicarpa (Small Pennywort)			
26.	6229 Hydrocotyle diantha			
27.	6233 Hydrocotyle lemnoides (Aquatic Pennywort)		P4	
28.	11074 Hydrocotyle striata		P1	
29.	19041 Trachymene coerulea subsp. coerulea			
30.	6280 Trachymene pilosa (Native Parsnip)			
Asparagaceae				
31.	11299 Chamaescilla corymbosa var. corymbosa			
32.	8788 Chamaescilla versicolor			
33.	1287 Dichopogon capillipes			
34.	11815 Laxmannia grandiflora subsp. grandiflora			
35.	11911 Laxmannia ramosa subsp. ramosa			
36.	11464 Laxmannia sessiliflora subsp. australis			
37.	1223 Lomandra caespitosa (Tufted Mat Rush)			
38.	1234 Lomandra nigricans			
39.	1236 Lomandra odora (Tiered Matrush)			
40.	1239 Lomandra preissii			
41.	1245 Lomandra spartea			
42.	1318 Thysanotus arbuscula			
43.	1319 Thysanotus arenarius			
44.	1338 Thysanotus manglesianus (Fringed Lily)			
45.	1351 Thysanotus sparteus			
46.	1354 Thysanotus tenellus			
47.	1357 Thysanotus thyrsoides			
48.	1358 Thysanotus triandrus			
Asteraceae				
49.	7838 Arctotheca calendula (Cape Weed)	Y		
50.	7867 Brachyscome bellidioides			
51.	7875 Brachyscome glandulosa			
52.	7878 Brachyscome iberidifolia			
53.	7882 Brachyscome perpusilla			
54.	7902 Calotis erinacea (Tangled Burr-daisy)			
55.	7935 Cichorium intybus (Chicory)	Y		
56.	7937 Cirsium vulgare (Spear Thistle, Scotch Thistle)	Y		
57.	7939 Conyza bonariensis (Flaxleaf Fleabane)	Y		

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
58.	7943	Cotula australis (Common Cotula)			
59.	7945	Cotula coronopifolia (Waterbuttons)	Y		
60.	7946	Cotula cotuloides (Smooth Cotula)			
61.	13354	Craspedia variabilis			
62.	15137	Euchiton sphaericus			
63.	8002	Gnephosis tenuissima			
64.	8010	Helianthus tuberosus (Jerusalem Artichoke)	Y		Y
65.	12741	Hyalosperma cotula			
66.	18585	Lagenophora huegelii			
67.	13284	Lawrencella rosea			
68.	8105	Millotia myosotidifolia			
69.	14344	Millotia tenuifolia var. tenuifolia (Soft Millotia)			
70.	29418	Monoculus monstrosus	Y		
71.	8114	Myriocephalus appendiculatus (White-tip Myriocephalus)			
72.	14187	Myriocephalus occidentalis			
73.	8143	Olearia paucidentata (Autumn Scrub Daisy)			
74.	18352	Pithocarpa pulchella var. melanostigma			
75.	8175	Podolepis gracilis (Slender Podolepis)			
76.	8177	Podolepis lessonii			
77.	8182	Podotheca angustifolia (Sticky Longheads)			
78.	8183	Podotheca chrysantha (Yellow Podotheca)			
79.	13255	Pterochaeta paniculata			
80.	13300	Rhodanthe citrina			
81.	15035	Rhodanthe corymbosa			
82.	13252	Rhodanthe pygmaea			
83.	13312	Rhodanthe pyrethrum			
84.	13309	Rhodanthe spicata			
85.	28251	Senecio barkhausioides			
86.	20663	Senecio multicaulis subsp. multicaulis			
87.	8224	Siloxerus filifolius			
88.	8225	Siloxerus humifusus (Procumbent Siloxerus)			
89.	25902	Symphotrichum squamatum (Bushy Starwort)	Y		
90.	8250	Tragopogon porifolius (Salsify)	Y		
91.	8251	Trichocline spathulata (Native Gerbera)			
92.	38388	Ursinia anthemoides subsp. anthemoides	Y		
93.	13328	Waitzia nitida			
94.	8282	Waitzia suaveolens (Fragrant Waitzia)			
95.	13333	Waitzia suaveolens var. suaveolens			
96.	8287	Xanthium spinosum (Bathurst Burr)	Y		
Boraginaceae					
97.	6681	Echium plantagineum (Paterson's Curse)	Y		
98.	29716	Halgania sp. Wongan Hills (K.F. Kenneally 2393)			
Boryaceae					
99.	1272	Borya scirpoidea			
100.	1273	Borya sphaerocephala (Pincushions)			
Brassicaceae					
101.	19989	Lepidium didymum	Y		
102.	3061	Raphanus raphanistrum (Wild Radish)	Y		
Byblidaceae					
103.	3178	Byblis gigantea (Rainbow Plant)		P3	
Campanulaceae					
104.	7396	Isotoma hypocrateriformis (Woodbridge Poison)			
105.	7398	Isotoma pusilla (Small Isotome)			
106.		Isotoma sp.			
107.	9289	Lobelia anceps (Angled Lobelia)			
108.	7403	Lobelia heterophylla (Wing-seeded Lobelia)			
109.	7407	Lobelia rhytidisperma (Wrinkled-seeded Lobelia)			
110.		Lobelia sp.			
111.	37440	Monopsis debilis var. depressa	Y		
112.	7384	Wahlenbergia capensis (Cape Bluebell)	Y		
113.	7389	Wahlenbergia preissii			
Caryophyllaceae					
114.	2891	Corrigiola litoralis (Strapwort)	Y		
115.	2905	Polycarpon tetraphyllum (Fourleaf Allseed)	Y		
116.	15972	Silene gallica var. gallica	Y		
Casuarinaceae					
117.	1732	Allocasuarina humilis (Dwarf Sheoak)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
118.	1734	Allocasuarina microstachya			
119.	1742	Casuarina obesa (Swamp Sheoak, Kuli)			
Celastraceae					
120.	4733	Stackhousia monogyna			
121.	4737	Tripterococcus brunonis (Winged Stackhousia)			
Centrolepidaceae					
122.	1116	Aphelia brizula			
123.	1118	Aphelia drummondii			
124.		Aphelia sp.			
125.	1121	Centrolepis aristata (Pointed Centrolepis)			
126.	1125	Centrolepis drummondiana			
127.	1129	Centrolepis glabra (Smooth Centrolepis)			
128.		Centrolepis sp.			
Chenopodiaceae					
129.	11368	Dysphania glomulifera subsp. glomulifera			
130.	33480	Dysphania pumilio (Clammy Goosefoot)			
131.	2639	Suaeda australis (Seablite)			
Colchicaceae					
132.	1382	Baeometra uniflora	Y		
133.	1385	Burchardia multiflora (Dwarf Burchardia)			
134.	12072	Wurmbea dioica subsp. alba			
135.	1401	Wurmbea pygmaea			
Commelinaceae					
136.	1162	Cartonema philydroides			
Convolvulaceae					
137.	6614	Convolvulus remotus			
Crassulaceae					
138.	11709	Crassula colorata var. acuminata			
139.	11563	Crassula colorata var. colorata			
140.	11349	Crassula decumbens var. decumbens			
141.	15706	Crassula natans var. minus	Y		
Cucurbitaceae					
142.	7372	Cucumis myriocarpus (Prickly Paddy Melon)	Y		
Cyperaceae					
143.	749	Bolboschoenus caldwellii (Marsh Club-rush)			
144.	753	Carex appressa (Tall Sedge)			
145.	756	Carex inversa (Knob Sedge)			
146.	759	Carex tereticaulis		P3	
147.	760	Caustis dioica			
148.	763	Chorizandra enodis (Black Bristlerush)			
149.	764	Chorizandra multiarticulata			
150.	768	Cyathochaeta avenacea			
151.	815	Cyperus tenellus (Tiny Flatsedge)	Y		
152.	816	Cyperus tenuiflorus (Scaly Sedge)	Y		
153.	917	Isolepis marginata (Coarse Club-rush)			
154.	930	Lepidosperma costale			
155.	937	Lepidosperma longitudinale (Pithy Sword-sedge)			
156.	940	Lepidosperma pubisquameum			
157.	944	Lepidosperma scabrum			
158.		Lepidosperma sp.			
159.	947	Lepidosperma tenue			
160.	957	Mesomelaena tetragona (Semaphore Sedge)			
161.	975	Schoenus bifidus			
162.	978	Schoenus brevisetis			
163.	984	Schoenus curvifolius			
164.	987	Schoenus elegans			
165.	991	Schoenus grammatophyllus			
166.	17606	Schoenus griffinianus		P4	
167.	1002	Schoenus nanus (Tiny Bog Rush)			
168.	17614	Schoenus plumosus			
169.	1011	Schoenus rigens			
170.	1016	Schoenus subbarbatus (Bearded Bog-rush)			
171.	1017	Schoenus subbulbosus			
172.	1026	Schoenus unispiculatus			
173.	17409	Schoenus varicellae			
174.	1036	Tetraria octandra			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
175.	43207	Tricostularia exsul			
Dasypogonaceae					
176.	19309	Calectasia narragara			
177.	1218	Dasypogon bromeliifolius (Pineapple Bush)			
Dicranaceae					
178.	32460	Campylopus acuminatus var. kirkii			
Dilleniaceae					
179.	5108	Hibbertia acerosa (Needle Leaved Guinea Flower)			
180.	5112	Hibbertia aurea			
181.	5114	Hibbertia commutata			
182.	20051	Hibbertia diamesogenos			
183.	5134	Hibbertia huegelii			
184.	5135	Hibbertia hypericoides (Yellow Buttercups)			
185.	5146	Hibbertia montana		P4	
186.	5150	Hibbertia nymphaea			
187.	5153	Hibbertia pachyrrhiza			
188.	5171	Hibbertia spicata			
189.	5173	Hibbertia subvaginata			
Dioscoreaceae					
190.	1509	Dioscorea hastifolia (Warrine, Warrarn)			
Droseraceae					
191.	3092	Drosera bulbosa (Red-leaved Sundew)			
192.	3095	Drosera erythrorhiza (Red Ink Sundew)			
193.	13211	Drosera erythrorhiza subsp. collina			
194.	3097	Drosera gigantea (Giant Sundew)			
195.	15453	Drosera gigantea subsp. gigantea			
196.	3098	Drosera glanduligera (Pimpernel Sundew)			
197.	3101	Drosera heterophylla (Swamp Rainbow)			
198.	14298	Drosera macrantha subsp. macrantha			
199.	11853	Drosera menziesii subsp. menziesii			
200.	13216	Drosera menziesii subsp. penicillaris			
201.	3114	Drosera nitidula (Shining Sundew)			
202.	3117	Drosera paleacea (Dwarf Sundew)			
203.	13188	Drosera paleacea subsp. paleacea			
204.	3118	Drosera pallida (Pale Rainbow)			
205.	3123	Drosera platystigma (Black-eyed Sundew)			
206.	8911	Drosera rosulata			
207.	3131	Drosera stolonifera (Leafy Sundew)			
208.	3135	Drosera zonaria (Painted Sundew)			
Elaeocarpaceae					
209.	4535	Tetratheca hirsuta (Black Eyed Susan)			
210.	4537	Tetratheca nuda			
Ericaceae					
211.	6311	Andersonia heterophylla			
212.	6314	Andersonia lehmanniana			
213.	11471	Andersonia lehmanniana subsp. lehmanniana			
214.	6321	Andersonia sprengelioides			
215.	6323	Astroloma ciliatum (Candle Cranberry)			
216.	6330	Astroloma macrocalyx (Swan Berry)			
217.	6334	Astroloma pallidum (Kick Bush)			
218.	6337	Astroloma stomarrhena (Red Swamp Cranberry)			
219.	6339	Astroloma xerophyllum			
220.	6348	Conostephium pendulum (Pearl Flower)			
221.	6349	Conostephium preissii			
222.	6360	Leucopogon australis (Spiked Beard-heath)			
223.	6374	Leucopogon conostephioides			
224.	6397	Leucopogon glaucifolius			
225.	6400	Leucopogon gracillimus			
226.	6436	Leucopogon propinquus			
227.	6439	Leucopogon pulchellus (Beard-heath)			
228.	6440	Leucopogon racemulosus			
229.	28311	Leucopogon sp. Great Southern (R.S. Cowan A 586)			
230.	40803	Leucopogon squarrosus subsp. squarrosus			
231.	6451	Leucopogon tenuis			
232.	34736	Lysinema pentapetalum			
233.	6476	Styphelia tenuiflora (Common Pinheath)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Euphorbiaceae				
234.	4626 Euphorbia drummondii (Caustic Weed, Piwi)			
235.	19585 Monotaxis grandiflora var. grandiflora			
236.	4666 Monotaxis occidentalis			
237.	4716 Stachystemon vermicularis			
Fabaceae				
238.	15429 Acacia alata var. alata			
239.	15466 Acacia applanata			
240.	3231 Acacia auronitens			
241.	3294 Acacia dentifera			
242.	3323 Acacia ericifolia			
243.	3374 Acacia huegelii			
244.	3382 Acacia incrassata			
245.	11611 Acacia lasiocarpa var. lasiocarpa			
246.	15721 Acacia lasiocarpa var. sedifolia			
247.	3442 Acacia microbotrya (Manna Wattle, Kalyang)			
248.	15481 Acacia pulchella var. glaberrima			
249.	15483 Acacia pulchella var. pulchella			
250.	3541 Acacia sessilis			
251.	3557 Acacia stenoptera (Narrow Winged Wattle)			
252.	3591 Acacia urophylla			
253.	3686 Aotus cordifolia			
254.	3688 Aotus gracillima			
255.	3710 Bossiaea eriocarpa (Common Brown Pea)			
256.	3714 Bossiaea ornata (Broad Leaved Brown Pea)			
257.	3719 Bossiaea spinescens			
258.	3753 Chorizema dicksonii (Yellow-eyed Flame Pea)			
259.	19861 Cristonia biloba			
260.	35838 Cristonia biloba subsp. biloba			
261.	3805 Daviesia decurrens (Prickly Bitter-pea)			
262.	3807 Daviesia divaricata (Marno)			
263.	11879 Daviesia hakeoides subsp. hakeoides			
264.	16585 Daviesia nudiflora subsp. nudiflora			
265.	3831 Daviesia pedunculata			
266.	3832 Daviesia physodes			
267.	3833 Daviesia podophylla			
268.	3834 Daviesia polyphylla			
269.	3845 Daviesia triflora			
270.	3872 Euchilopsis linearis (Swamp Pea)			
271.	3880 Eutaxia virgata			
272.	20475 Gastrolobium capitatum			
273.	20513 Gastrolobium dilatatum			
274.	20473 Gastrolobium ebracteolatum			
275.	20483 Gastrolobium linearifolium			
276.	3912 Gastrolobium oxylobioides (Champion Bay Poison)			
277.	3923 Gastrolobium spathulatum (Poison Bush)			
278.	3926 Gastrolobium stipulare		P4	
279.	3933 Gastrolobium villosum (Crinkle-leaved Poison)			
280.	3945 Gompholobium aristatum			
281.	3951 Gompholobium marginatum			
282.	3956 Gompholobium shuttleworthii			
283.	3957 Gompholobium tomentosum (Hairy Yellow Pea)			
284.	3964 Hovea chorizemifolia (Holly-leaved Hovea)			
285.	3966 Hovea pungens (Devil's Pins, Puyenak)			
286.	3968 Hovea trisperma (Common Hovea)			
287.	3973 Indigofera colutea (Sticky Indigo)			
288.	3992 Isotropis cuneifolia (Granny Bonnets)			
289.	19700 Isotropis cuneifolia subsp. cuneifolia			
290.	3997 Jacksonia alata			
291.	3998 Jacksonia angulata			
292.	14783 Jacksonia calcicola			
293.	4010 Jacksonia floribunda (Holly Pea)			
294.	4018 Jacksonia lehmannii			
295.	4025 Jacksonia restioides			
296.	4027 Jacksonia sericea (Waldjumi)		P4	
297.	4029 Jacksonia sternbergiana (Stinkwood, Kapur)			
298.	4037 Kennedia coccinea (Coral Vine)			
299.	4044 Kennedia prostrata (Scarlet Runner)			
300.	4045 Kennedia stirlingii (Bushy Kennedia)			
301.	11289 Labichea lanceolata subsp. lanceolata			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
302.	3669	Labichea punctata (Lance-leaved Cassia)			
303.	4067	Lupinus luteus (Yellow Lupin)	Y		
304.	4072	Medicago arabica (Spotted Medic)	Y		
305.	4100	Mirbelia spinosa			
306.	17114	Paraserianthes lophantha subsp. lophantha			
307.		Pisum sativum var. arvense			Y
308.	4172	Pultenaea ericifolia			
309.	4205	Sphaerolobium linophyllum			
310.	4207	Sphaerolobium medium			
311.	4211	Sphaerolobium vimineum (Leafless Globe Pea)			
312.	4251	Templetonia drummondii			
313.	17759	Trifolium fragiferum var. fragiferum	Y		
314.	4297	Trifolium glomeratum (Cluster Clover)	Y		
315.	4298	Trifolium hirtum (Rose Clover)	Y		
316.	17758	Trifolium hybridum var. hybridum	Y		
317.	4303	Trifolium micranthum (Slender Suckling Clover)	Y		
318.	4315	Trifolium tomentosum (Woolly Clover)	Y		
319.	34772	Vachellia karroo	Y		
320.	4319	Vicia benghalensis (Purple Vetch)	Y		
321.	4325	Viminaria juncea (Swishbush, Koweda)			
Gentianaceae					
322.	6539	Centaurium erythraea (Common Centaury)	Y		
323.	6542	Centaurium tenuiflorum	Y		
Geraniaceae					
324.	4332	Erodium botrys (Long Storksbill)	Y		
325.	4335	Erodium cygnorum (Blue Heronsbill)			
326.	4343	Pelargonium capitatum (Rose Pelargonium)	Y		
Goodeniaceae					
327.	12724	Anthotium junciforme			
328.	7428	Dampiera coronata (Wedge-leaved Dampiera)			
329.	7454	Dampiera linearis (Common Dampiera)			
330.	7462	Dampiera pedunculata			
331.	7475	Dampiera spicigera (Spiked Dampiera)			
332.	7484	Dampiera trigona (Angled-stem Dampiera)			
333.	8614	Goodenia claytoniacea			
334.	29362	Goodenia coerulea			
335.	12551	Goodenia micrantha			
336.	19286	Goodenia pulchella subsp. Coastal Plain A (M. Hislop 634)			
337.	7568	Lechenaultia biloba (Blue Leschenaultia)			
338.	7572	Lechenaultia expansa			
339.	7574	Lechenaultia floribunda (Free-flowering Leschenaultia)			
340.	7603	Scaevola canescens (Grey Scaevola)			
341.	7613	Scaevola glandulifera (Viscid Hand-flower)			
342.	7636	Scaevola platyphylla (Broad-leaved Fanflower)			
343.	12585	Scaevola repens			
344.	7665	Velleia trinervis			
Haemodoraceae					
345.	1406	Anigozanthos bicolor (Little Kangaroo Paw)			
346.	11470	Anigozanthos bicolor subsp. bicolor			
347.	1407	Anigozanthos flavidus (Tall Kangaroo Paw)			
348.	1409	Anigozanthos humilis (Catspaw)			
349.	11434	Anigozanthos humilis subsp. humilis			
350.	1411	Anigozanthos manglesii (Mangles Kangaroo Paw, Kurulbrang)			
351.	11261	Anigozanthos manglesii subsp. manglesii			
352.	11566	Anigozanthos viridis subsp. viridis			
353.	1417	Blancoa canescens (Winter Bell)			
354.	11826	Conostylis aculeata subsp. aculeata			
355.	1423	Conostylis aurea (Golden Conostylis)			
356.	11438	Conostylis candicans subsp. candicans			
357.	12035	Conostylis caricina subsp. caricina			
358.	11695	Conostylis festuacea subsp. festuacea			
359.	1436	Conostylis juncea			
360.	11597	Conostylis setigera subsp. setigera			
361.	1464	Haemodorum brevisepalum			
362.	1468	Haemodorum laxum			
363.	1472	Haemodorum simplex			
364.	1474	Haemodorum sparsiflorum			
365.	1475	Haemodorum spicatum (Mardja)			

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366.	1478	Phlebocarya ciliata			
367.	1481	Tribonanthes australis			
368.	1482	Tribonanthes brachypetala			
369.	1483	Tribonanthes longipetala			
370.	1485	Tribonanthes violacea			
Haloragaceae					
371.	6143	Glischrocaryon aureum (Common Popflower)			
372.	6161	Gonocarpus pithyoides			
373.	34676	Meionectes brownii (Swamp Raspwort)			
374.	33638	Meionectes tenuifolia		P3	
375.	6189	Myriophyllum crispatum			
376.	6192	Myriophyllum drummondii			
377.	6193	Myriophyllum echinatum		P3	
378.	6195	Myriophyllum limnophilum			
379.	35016	Trihaloragis hexandra subsp. integrifolia			
Hemerocallidaceae					
380.	23474	Agrostocrinum hirsutum			
381.	1264	Arnocrinum preissii			
382.	11636	Dianella revoluta var. divaricata			
383.	19632	Johnsonia pubescens subsp. pubescens			
384.	1260	Stypandra glauca (Blind Grass)			
385.	1361	Tricoryne elatior (Yellow Autumn Lily)			
386.	1362	Tricoryne humilis			
Hydatellaceae					
387.	1139	Trithuria bibracteata			
388.	32658	Trithuria occidentalis (Swan Hydatella)		T	
389.		Trithuria sp.			Y
Hydrocharitaceae					
390.	159	Egeria densa (Dense Waterweed)	Y		
391.	166	Hydrilla verticillata (Water Thyme)			
392.	168	Ottelia ovalifolia (Swamp Lily)			
Hypericaceae					
393.	5180	Hypericum gramineum (Small St John's Wort)			
394.		Hypericum monogynum			Y
Hypoxidaceae					
395.	43761	Pauridia occidentalis var. occidentalis			
396.	43762	Pauridia occidentalis var. quadriloba			
Iridaceae					
397.	18279	Babiana angustifolia	Y		
398.	1513	Chasmanthe floribunda (African Cornflag)	Y		
399.	18392	Freesia alba x leichtlinii	Y		
400.	1524	Gladiolus undulatus (Wild Gladiolus)	Y		
401.	1526	Hesperantha falcata	Y		
402.	19180	Moraea miniata (Two-leaf Cape Tulip)	Y		
403.	11442	Orthrosanthus laxus var. gramineus (Grass-leaved Orthrosanthus)			
404.	11749	Orthrosanthus laxus var. laxus (Morning Iris)			
405.	1546	Patersonia juncea (Rush Leaved Patersonia)			
406.	1550	Patersonia occidentalis (Purple Flag, Koma)			
407.	1554	Romulea flava	Y		
408.	1556	Romulea rosea (Guildford Grass)	Y		
409.	11544	Romulea rosea var. australis (Guildford Grass)	Y		
410.	1558	Sparaxis bulbifera	Y		
411.	1566	Watsonia marginata	Y		
Juncaceae					
412.	1178	Juncus bufonius (Toad Rush)	Y		
413.	1180	Juncus capitatus (Capitate Rush)	Y		
414.	1188	Juncus pallidus (Pale Rush)			
415.	1195	Juncus subsecundus (Finger Rush)			
Juncaginaceae					
416.	40661	Cycnogeton lineare			
417.	147	Triglochin mucronata			
418.	18587	Triglochin nana			
419.	151	Triglochin striata			
Lamiaceae					
420.	6836	Hemiandra incana			

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421.	6838	Hemiandra linearis (Speckled Snakebush)			
422.	6839	Hemiandra pungens (Snakebush)			
423.	33277	Hemigenia argentea			
424.	6856	Hemigenia incana (Silky Hemigenia)			
425.	29632	Hemigenia parviflora			
426.	41020	Hemiphora bartlingii (Woolly Dragon)			
Lauraceae					
427.	2956	Cassytha pomiformis (Dodder Laurel)			
Lentibulariaceae					
428.	7138	Utricularia inaequalis			
429.	7145	Utricularia menziesii (Redcoats)			
430.	7148	Utricularia multifida			
431.	7157	Utricularia violacea (Violet Bladderwort)			
Lepidoziaceae					
432.		Paracromastigum longiscyphum			
Linaceae					
433.	4363	Linum trigynum (French Flax)	Y		
434.	4364	Linum usitatissimum (Flax)	Y		
Loganiaceae					
435.	6506	Logania campanulata (Bell-flowered Logania)			
436.	6508	Logania flaviflora (Yellow Logania)			
437.	16825	Phyllangium divergens			
438.	17366	Phyllangium palustre		P2	
Lythraceae					
439.	5281	Lythrum hyssopifolia (Lesser Loosestrife)	Y		
Malvaceae					
440.	40864	Commersonia cygnorum			
441.	45081	Lasiosipetalum glutinosum subsp. glutinosum		P3	
442.	4961	Malva parviflora (Marshmallow)	Y		
443.	5080	Thomasia foliosa			
444.	5084	Thomasia grandiflora (Large Flowered Thomasia)			
Marsileaceae					
445.	74	Marsilea drummondii (Common Nardoo)			
Menyanthaceae					
446.	36160	Liparophyllum capitatum			
447.	36179	Liparophyllum violifolium			
448.	36177	Ornduffia albiflora			
Molluginaceae					
449.	2838	Macarthuria apetala			
450.	2839	Macarthuria australis			
Myrtaceae					
451.	5330	Astartea fascicularis			
452.	36441	Babingtonia camphorosmae (Camphor Myrtle)			
453.	5390	Beaufortia purpurea		P3	
454.	5395	Callistemon phoeniceus (Lesser Bottlebrush, Dubarda)			
455.	35816	Calothamnus quadrifidus subsp. quadrifidus			
456.	5429	Calothamnus sanguineus (Silky-leaved Blood flower, Pindak)			
457.	5439	Calytrix angulata (Yellow Starflower)			
458.	5441	Calytrix aurea			
459.	13653	Calytrix breviseta subsp. breviseta		T	
460.	5458	Calytrix flavescens (Summer Starflower)			
461.	5460	Calytrix fraseri (Pink Summer Calytrix)			
462.	5461	Calytrix glutinosa			
463.	5465	Calytrix leschenaultii			
464.	5498	Chamelaucium uncinatum (Geraldton Wax)			
465.	17104	Corymbia calophylla (Marri)			
466.	5508	Darwinia citriodora (Lemon-scented Darwinia)			
467.	5531	Darwinia thymoides			
468.	5540	Eremaea fimbriata			
469.	5688	Eucalyptus laeliae (Darling Range Ghost Gum)			
470.	13547	Eucalyptus marginata subsp. marginata (Jarrah)			
471.	5739	Eucalyptus patens (Swan River Blackbutt, Dwuda)			
472.	5763	Eucalyptus rudis (Flooded Gum, Kulurda)			
473.	5790	Eucalyptus todtiana (Coastal Blackbutt)			
474.	5797	Eucalyptus wandoo (Wandoo, Wondu)			

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475.	12906	Eucalyptus wandoo subsp. wandoo			
476.	5816	Homalospermum firmum			
477.	5817	Hypocalymma angustifolium (White Myrtle, Kudjid)			
478.	35074	Hypocalymma angustifolium subsp. Dandaragan plateau (S. Patrick 702A)			
479.	35070	Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777)			
480.	5926	Melaleuca lateritia (Robin Redbreast Bush)			
481.	20297	Melaleuca osullivanii			
482.	5952	Melaleuca preissiana (Moonah)			
483.	5959	Melaleuca raphiophylla (Swamp Paperbark)			
484.	5964	Melaleuca seriata			
485.		Melaleuca sp.			
486.	5975	Melaleuca subtrigona			
487.	5978	Melaleuca teretifolia (Banbar)			
488.	5983	Melaleuca trichophylla			
489.	13280	Melaleuca viminea subsp. viminea			
490.	16477	Pericalymma ellipticum var. ellipticum			
491.	16478	Pericalymma ellipticum var. floridum			
492.	6012	Regelia ciliata			
493.	6019	Rinzia communis			
494.	12388	Verticordia acerosa var. preissii			
495.	15432	Verticordia densiflora var. densiflora			
496.	6077	Verticordia drummondii (Drummond's Featherflower)			
497.	6088	Verticordia huegelii (Variegated Featherflower)			
498.	15433	Verticordia huegelii var. huegelii			
499.	6107	Verticordia pennigera			
500.	6109	Verticordia picta (Painted Featherflower)			
501.	12449	Verticordia plumosa var. brachyphylla			
Oleaceae					
502.	40241	Fraxinus angustifolia	Y		
Onagraceae					
503.	20052	Oenothera jamesii	Y		
Orchidaceae					
504.	11136	Caladenia denticulata			
505.	44900	Caladenia denticulata subsp. rubella			
506.	1586	Caladenia discoidea (Dancing Orchid)			
507.	15348	Caladenia flava subsp. flava			
508.	15502	Caladenia footeana			
509.	15354	Caladenia hirta subsp. hirta			
510.	1599	Caladenia latifolia (Pink Fairy Orchid)			
511.	15377	Caladenia reptans subsp. reptans			
512.	1614	Caladenia roei (Ant Orchid)			
513.	15114	Cyanicula gemmata			
514.	1634	Diuris laxiflora (Bee Orchid)			
515.	1635	Diuris longifolia (Common Donkey Orchid)			
516.		Diuris sp.			
517.	15406	Drakaea gracilis			
518.	1643	Elythranthera brunonis (Purple Enamel Orchid)			
519.	1644	Elythranthera emarginata (Pink Enamel Orchid)			
520.	15412	Eriochilus dilatatus subsp. multiflorus			
521.	15414	Eriochilus helonomos			
522.	15415	Eriochilus scaber subsp. scaber			
523.	1653	Leporella fimbriata (Hare Orchid)			
524.	15418	Leptoceras menziesii			
525.	1657	Microtis alba (White Mignonette Orchid)			
526.	34158	Microtis albobiviridis			
527.	1658	Microtis atrata (Swamp Mignonette Orchid)			
528.	12199	Microtis familiaris			
529.	10954	Microtis media (Tall Mignonette Orchid)			
530.	12761	Microtis media subsp. densiflora			
531.		Microtis sp.			
532.		Paracaleana sp.			
533.	20460	Pheladenia deformis			
534.		Plumatchilos barbata			
535.	1669	Prasophyllum cyphochilum (Pouched Leek Orchid)			
536.	1670	Prasophyllum drummondii (Swamp Leek Orchid)			
537.	1672	Prasophyllum fimbria (Fringed Leek Orchid)			
538.	1674	Prasophyllum giganteum (Bronze Leek Orchid)			
539.	1677	Prasophyllum macrostachyum (Laughing Leek Orchid)			
540.	1680	Prasophyllum parvifolium (Autumn Leek Orchid)			

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541.	10853	Prasophyllum plumiforme			
542.	15426	Pterostylis aspera			
543.	12217	Pterostylis sanguinea			
544.	1698	Pterostylis vittata (Banded Greenhood)			
545.	1701	Thelymitra antennifera (Vanilla Orchid)			
546.	10856	Thelymitra benthamiana (Leopard Orchid)			
547.	1705	Thelymitra crinita (Blue Lady Orchid)			
548.	1707	Thelymitra flexuosa (Twisted Sun Orchid)			
549.	11053	Thelymitra macrophylla			
550.	10862	Thelymitra stellata (Star Orchid)		T	
551.	1717	Thelymitra variegata (Queen of Sheba)		P2	
Oxalidaceae					
552.	18331	Oxalis debilis var. corymbosa (Pink Shamrock)	Y		
553.	30375	Oxalis exilis			
554.	4352	Oxalis glabra	Y		
555.	4356	Oxalis pes-caprae (Soursob)	Y		
556.	4358	Oxalis purpurea (Largeflower Wood Sorrel)	Y		
Phrymaceae					
557.	7061	Glossostigma drummondii (Mudmat)			
Phyllanthaceae					
558.	4675	Phyllanthus calycinus (False Boronia)			
559.	4688	Poranthera drummondii			
560.	4691	Poranthera microphylla (Small Poranthera)			
Phytolaccaceae					
561.	2793	Phytolacca octandra (Red Ink Plant)	Y		
Pittosporaceae					
562.	25788	Billardiera fraseri (Elegant Pronaya)			
Plantaginaceae					
563.	14282	Gratiola pubescens			
564.	7067	Kickxia elatine (Pointed Toadflax)	Y		
565.	7068	Kickxia spuria (Roundleaf Toadflax)	Y		
Poaceae					
566.	185	Aira cupaniana (Silvery Hairgrass)	Y		
567.	194	Amphipogon amphipogonoides			
568.	226	Arundo donax (Giant Reed)	Y		
569.	17233	Austrostipa campylachne			
570.	17234	Austrostipa compressa			
571.	17257	Austrostipa variabilis			
572.	8661	Brachypodium distachyon (False Brome)	Y		
573.	244	Briza maxima (Blowfly Grass)	Y		
574.	245	Briza minor (Shivery Grass)	Y		
575.	248	Bromus catharticus (Prairie Grass)	Y		
576.	250	Bromus hordeaceus (Soft Brome)	Y		
577.	252	Bromus madritensis (Madrid Brome)	Y		
578.		Bromus sp.			
579.	41566	Cenchrus longisetus (Feathertop)	Y		
580.	41567	Cenchrus macrourus (African Feather Grass)	Y		
581.	277	Cortaderia selloana (Pampas Grass)	Y		
582.	347	Ehrharta calycina (Perennial Veldt Grass)	Y		
583.	376	Eragrostis curvula (African Lovegrass)	Y		
584.	429	Eustachys distichophylla (Evergreen Chloris)	Y		
585.	20019	Lachnagrostis filiformis			
586.	475	Lolium multiflorum (Italian Ryegrass)	Y		
587.		Lolium sp.			
588.	14985	Melinis repens	Y		
589.	492	Neurachne alopecuroides (Foxtail Mulga Grass)			
590.		Neurachne alopecuroides			
591.	502	Panicum capillare (Witchgrass)	Y		
592.	40423	Pentameris airoides (False Hairgrass)	Y		
593.	582	Polypogon monspeliensis (Annual Beardgrass)	Y		
594.	40426	Rytidosperma occidentale			
595.	40427	Rytidosperma setaceum			
596.	19453	Setaria parviflora	Y		
597.	613	Setaria verticillata (Whorled Pigeon Grass)	Y		
598.	617	Sorghum halepense (Johnson Grass)	Y		
599.	35236	Sorghum x drummondii (Sudan Grass)	Y		
600.	8710	Sporobolus africanus (Parramatta Grass)			

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601.	45118 Sporobolus schoenoides	Y		
602.	635 Sporobolus virginicus (Marine Couch)	Y		
603.	636 Stenotaphrum secundatum (Buffalo Grass)	Y		
604.	12052 Vulpia myuros forma megalura	Y		
Polygalaceae				
605.	4550 Comesperma calymega (Blue-spike Milkwort)			
606.	4551 Comesperma ciliatum			
607.	4554 Comesperma flavum			
Portulacaceae				
608.	2856 Calandrinia liniflora (Parakeelya)			
Potamogetonaceae				
609.	44492 Stuckenia pectinata			
Primulaceae				
610.	36373 Lysimachia minima	Y		
611.	6483 Samolus junceus			
Proteaceae				
612.	14970 Adenanthos barbiger			
613.	1791 Adenanthos obovatus (Basket Flower)			
614.	32682 Banksia armata var. armata			
615.	32580 Banksia dallanneyi var. dallanneyi			
616.	1819 Banksia grandis (Bull Banksia, Pulgarla)			
617.	1834 Banksia menziesii (Firewood Banksia)			
618.	32202 Banksia nivea (Honey-pot Dryandra, Pudjam)			
619.	32080 Banksia sessilis var. sessilis			
620.	1852 Banksia telmatiaea (Swamp Fox Banksia)			
621.	1857 Conospermum acerosum (Needle-leaved Smokebush)			
622.	15607 Conospermum acerosum subsp. acerosum			
623.	1875 Conospermum huegelii (Slender Smokebush)			
624.	1876 Conospermum incurvum (Plume Smokebush)			
625.	15520 Conospermum stoechadis subsp. sclerophyllum			
626.	15611 Conospermum stoechadis subsp. stoechadis (Common Smokebush)			
627.	13999 Conospermum undulatum		T	
628.	19628 Grevillea bipinnatifida subsp. bipinnatifida			
629.	19630 Grevillea bipinnatifida subsp. pagna		P1	
630.	13429 Grevillea diversifolia subsp. diversifolia			
631.	1997 Grevillea endlicheriana (Spindly Grevillea)			
632.	2032 Grevillea leucopteris (White Plume Grevillea)			
633.	13450 Grevillea manglesii subsp. manglesii			
634.	2066 Grevillea pilulifera (Woolly-flowered Grevillea)			
635.	2122 Grevillea wilsonii (Native Fuchsia)			
636.	2136 Hakea candolleana			
637.	2143 Hakea conchifolia (Shell-leaved Hakea)			
638.	2149 Hakea cristata (Snail Hakea)			
639.	2158 Hakea erinacea (Hedge-hog Hakea)			
640.	2166 Hakea incrassata (Marble Hakea)			
641.	2175 Hakea lissocarpha (Honey Bush)			
642.	2185 Hakea myrtoides (Myrtle Hakea)			
643.	45333 Hakea neospathulata			
644.	2197 Hakea prostrata (Harsh Hakea)			
645.	2212 Hakea sulcata (Furrowed Hakea)			
646.	2214 Hakea trifurcata (Two-leaf Hakea)			
647.	2215 Hakea undulata (Wavy-leaved Hakea)			
648.	2216 Hakea varia (Variable-leaved Hakea)			
649.	2221 Isopogon asper			
650.	2228 Isopogon drummondii		P3	
651.	2229 Isopogon dubius (Pincushion Coneflower)			
652.	2249 Lambertia multiflora (Many-flowered Honeysuckle)			
653.	14083 Lambertia multiflora var. darlingensis			
654.	Lambertia multiflora var. darlingensis			
655.	2255 Persoonia angustiflora			
656.	2262 Persoonia elliptica (Spreading Snottygobble)			
657.	2284 Petrophile biloba (Granite Petrophile)			
658.	2299 Petrophile linearis (Pixie Mops)			
659.	2301 Petrophile macrostachya			
660.	2308 Petrophile seminuda			
661.	20053 Petrophile squamata subsp. northern (J. Monks 40)			
662.	2312 Petrophile striata			

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663.	2316 <i>Stirlingia latifolia</i> (Blueboy)			
664.	2317 <i>Stirlingia simplex</i>			
665.	2321 <i>Synaphea acutiloba</i> (Granite Synaphea)			
666.	2325 <i>Synaphea pinnata</i> (Helena Synaphea)			
667.	30751 <i>Synaphea</i> sp. Pinjarra Plain (A.S. George 17182)		T	
668.	15532 <i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
669.	2330 <i>Xylomelum angustifolium</i> (Sandplain Woody Pear)			
Pteridaceae				
670.	29 <i>Anogramma leptophylla</i> (Annual Fern)			
671.	31 <i>Cheilanthes austrotenuifolia</i>			
Restionaceae				
672.	1056 <i>Alexgeorgea nitens</i>			
673.	17685 <i>Chaetanthes aristatus</i>			
674.	17706 <i>Chordifex sinuosus</i>			
675.	17692 <i>Cytogonidium leptocarpoides</i>			
676.	15831 <i>Desmocladius castaneus</i>			
677.	17691 <i>Desmocladius fasciculatus</i>			
678.	16595 <i>Desmocladius flexuosus</i>			
679.	1070 <i>Hypolaena exsulca</i>			
680.	1075 <i>Lepidobolus preissianus</i>			
681.	18074 <i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>			
682.	19241 <i>Lepyrodia curvescens</i>		P2	
683.	<i>Lepyrodia curvescens</i> MS			
684.	1088 <i>Lepyrodia macra</i> (Large Scale Rush)			
685.	15562 <i>Lepyrodia riparia</i>			
686.	15835 <i>Loxocarya striata</i>			
687.	17683 <i>Meeboldina cana</i>			
688.	17679 <i>Meeboldina coangustata</i>			
689.	17678 <i>Meeboldina kraussii</i>			
690.	17684 <i>Tremulina tremula</i>			
Rhamnaceae				
691.	4792 <i>Cryptandra arbutiflora</i> (Waxy Cryptandra)			
692.	13470 <i>Cryptandra arbutiflora</i> var. <i>arbutiflora</i>			
693.	13484 <i>Cryptandra arbutiflora</i> var. <i>tubulosa</i>			
694.	4810 <i>Cryptandra scoparia</i>			
695.	13479 <i>Trymalium ledifolium</i> var. <i>rosmarinifolium</i>			
696.	33418 <i>Trymalium odoratissimum</i> subsp. <i>odoratissimum</i>			
Rosaceae				
697.	20496 <i>Rubus laudatus</i>	Y		
Rubiaceae				
698.	<i>Opercularia</i> sp.			
699.	18255 <i>Opercularia vaginata</i> (Dog Weed)			
Rutaceae				
700.	4414 <i>Boronia cymosa</i> (Granite Boronia)			
701.	4444 <i>Boronia tenuis</i> (Blue Boronia)		P4	
702.	4454 <i>Diplolaena dampieri</i> (Southern Diplolaena)			
703.	18529 <i>Philotheca spicata</i> (Pepper and Salt)			
Salicaceae				
704.	20063 <i>Salix babylonica</i>	Y		
Santalaceae				
705.	2344 <i>Leptomeria empetrifomis</i>			
Sapindaceae				
706.	18589 <i>Diplopeltis huegelii</i> subsp. <i>lehmannii</i>			
707.	4755 <i>Dodonaea bursarifolia</i>			
708.	4761 <i>Dodonaea ericoides</i>			
Scrophulariaceae				
709.	13405 <i>Phyllopodium cordatum</i>	Y		
Selaginellaceae				
710.	6 <i>Selaginella gracillima</i> (Tiny Clubmoss)			
Solanaceae				
711.	11114 <i>Solanum giganteum</i>	Y		
712.	7020 <i>Solanum linnaeanum</i> (Apple of Sodom)	Y		
713.	7039 <i>Solanum triflorum</i> (Threeflower Nightshade)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Stylidiaceae				
714.	7674 Levenhookia preissii (Preiss's Stylewort)			
715.	7676 Levenhookia pusilla (Midget Stylewort)			
716.	7677 Levenhookia stipitata (Common Stylewort)			
717.	7679 Stylidium adpressum (Trigger-on-stilts)			
718.	7681 Stylidium affine (Queen Triggerplant)			
719.	7684 Stylidium amoenum (Lovely Triggerplant)			
720.	30278 Stylidium androsaceum			
721.	30276 Stylidium bicolor			
722.	7693 Stylidium brunonianum (Pink Fountain Triggerplant)			
723.	7696 Stylidium calcaratum (Book Triggerplant)			
724.	7699 Stylidium carnosum (Fleshy-leaved Triggerplant)			
725.	7712 Stylidium despectum (Dwarf Triggerplant)			
726.	7713 Stylidium dichotomum (Pins-and-needles)			
727.	7716 Stylidium diuroides (Donkey Triggerplant)			
728.	7717 Stylidium divaricatum (Daddy-long-legs)			
729.	7734 Stylidium guttatum (Dotted Triggerplant)			
730.	13083 Stylidium lateriticola			
731.	7756 Stylidium longitubum (Jumping Jacks)		P4	
732.	7768 Stylidium obtusatum (Pinafore Triggerplant)			
733.	7773 Stylidium petiolare (Horn Triggerplant)			
734.	7781 Stylidium pubigerum (Yellow Butterfly Triggerplant)			
735.	7782 Stylidium pulchellum (Thumbelina Triggerplant)			
736.	33106 Stylidium recurvum			
737.	7785 Stylidium repens (Matted Triggerplant)			
738.	7790 Stylidium roseoalatum (Pink-wing Triggerplant)			
739.	7798 Stylidium schoenoides (Cow Kicks)			
740.	Stylidium sp.			
741.	23511 Stylidium thesioides (Delicate Triggerplant)			
742.	7806 Stylidium utricularioides (Pink Fan Triggerplant)			
743.	40947 Stylidium xanthellum			
Thymelaeaceae				
744.	5231 Pimelea angustifolia (Narrow-leaved Pimelea)			
745.	11404 Pimelea imbricata var. major			
746.	11402 Pimelea imbricata var. piligera			
747.	5261 Pimelea rosea (Rose Banjine)			
748.	Pimelea sp.			
Typhaceae				
749.	99 Typha orientalis (Bulrush, Cumbungi)	Y		
Violaceae				
750.	5216 Hybanthus calycinus (Wild Violet)			
Xanthorrhoeaceae				
751.	1249 Xanthorrhoea acanthostachya			
752.	1256 Xanthorrhoea preissii (Grass tree, Palga)			

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 wholly 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.



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: 24/08/16 17:38:49

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 5.0Km



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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	41
Listed Migratory Species:	20

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. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

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:	4
Commonwealth Heritage Places:	None
Listed Marine Species:	26
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	4
Regional Forest Agreements:	1
Invasive Species:	41
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

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
Claypans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area
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
Shrublands and Woodlands of the eastern Swan Coastal Plain	Endangered	Community known to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, 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	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
Macronectes giganteus		within area
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pachyptila turtur subantarctica		
Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche cauta cauta		
Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi		
White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Plants		
Acacia anomala		
Grass Wattle, Chittering Grass Wattle [8153]	Vulnerable	Species or species habitat may occur within area
Acacia aphylla		
Leafless Rock Wattle [13553]	Vulnerable	Species or species habitat known to occur within area
Andersonia gracilis		
Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area
Anigozanthos viridis subsp. terraspectans		
Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area
Caladenia huegelii		
King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
Calytrix breviseta subsp. breviseta		
Swamp Starflower [23879]	Endangered	Species or species habitat may occur within area
Chamelaucium sp. Gingin (N.G.Marchant s.n., 4/11/1988)		
Gingin Wax [64649]	Endangered	Species or species habitat may occur within area
Conospermum undulatum		
Wavy-leaved Smokebush [24435]	Vulnerable	Species or species habitat likely to occur within area
Diuris micrantha		
Dwarf Bee-orchid [55082]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leafed 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 may occur within area
Eucalyptus balanites Cadda Road Mallee, Cadda Mallee [24264]	Endangered	Species or species habitat may occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat likely to occur within area
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat likely to occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat known to occur within area
Trithuria occidentalis Swan Hydatella [42224]	Endangered	Species or species habitat likely to occur within area

Reptiles

Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known 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
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species

Name	Threatened	Type of Presence habitat likely to occur within area
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Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Defence - BUSHMEAD RIFLE RANGE Defence - BUSHMEAD TRAINING AREA Defence - PALMER BARRACKS - SOUTH GUILDFORD

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		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
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 known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur

Name	Threatened	Type of Presence
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		within area Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur

Name	Threatened	Type of Presence within area
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Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Greenmount	WA
Talbot Road	WA
Unnamed WA45106	WA
Unnamed WA49079	WA

Regional Forest Agreements [\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

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
Birds		

Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area

Mammals

Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		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

Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
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

Name	Status	Type of Presence
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		area Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to 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] Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area Species or species habitat likely to 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
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		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 Sterile Pussy Willow [68497]		Species or species 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
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area
Nationally Important Wetlands		[Resource Information]
Name		State
Perth Airport Woodland Swamps		WA
Swan-Canning Estuary		WA

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 and National Heritage properties, Wetlands of International and National 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.

Coordinates

-31.89726 116.00901

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:

- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Parks and Wildlife Commission NT, Northern Territory Government](#)
- [Department of Environmental and Heritage Protection, Queensland](#)
- [Department of Parks and Wildlife, Western Australia](#)
- [Environment and Planning Directorate, ACT](#)
- [Birdlife Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [Museum Victoria](#)
- [Australian Museum](#)
- [South Australian 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](#)
- [Forestry Corporation, 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.

Appendix 4
Conservation significant flora and
ecological community definitions

Conservation Codes for Western Australia (Western Australian Herbarium 1998-)

Under the *Wildlife Conservation Act* (1950), the Minister for the Environment may declare species of flora to be protected if they are considered to be in danger of extinction, rare or otherwise in need of special protection. Schedules 1 and 2 deal with those that are threatened and those that are presumed extinct, respectively.

T: Threatened Flora (Declared Rare Flora – Extant)

Species which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the *Wildlife Conservation Act 1950*).

Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List Criteria:

- CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
- EN: Endangered – considered to be facing a very high risk of extinction in the wild
- VU: Vulnerable – considered to be facing a high risk of extinction in the wild
- X: Presumed Extinct Flora (Declared Rare Flora – Extinct).

Species that have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the *Wildlife Conservation Act 1950*).

Priority Flora

Species that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora List under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation Dependent species are placed in Priority 5.

Priority One: Poorly-known Species

Species that are known from one or a few collections or sight records (generally less than 5), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

Priority Two: Poorly-known Species

Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

Priority Three: Poorly-known Species

Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

Priority Four: Rare, Near Threatened and other species in need of monitoring

1. Rare: Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
2. Near Threatened: Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
3. Species that have been removed from the list of threatened species during the past 5 years for reasons other than taxonomy.

Priority 5: Conservation Dependent Species

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within 5 years.

Definition of Threatened Ecological Communities (DEC 2010)

Presumed Totally Destroyed (PD)

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies:

- records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or
- all occurrences recorded within the last 50 years have since been destroyed.

Critically Endangered (CR)

An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria:

1. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply:
 - (a) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years)
 - (b) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.
2. Current distribution is limited, and one or more of the following apply:
 - (a) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years)
 - (b) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes
 - (c) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.
3. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Endangered (EN)

An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria:

1. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply:
 - (a) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years)
 - (b) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

2. Current distribution is limited, and one or more of the following apply"
 - (a) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years)
 - (b) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes
 - (c) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.
3. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Vulnerable (VU)

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria:

1. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.
2. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
3. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Definition of Priority Ecological Communities (DEC 2010)

Priority One: Poorly-known ecological communities

Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities

Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

- communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation
- communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat
- communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four

Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. These include:

1. Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
2. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
3. Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix B Black Cockatoo Survey – Kirkby 2020

PROJECT: **WORKSHOP AVENUE, MIDLAND**
CLIENT: **CITY OF SWAN**
DATE: **3 SEPTEMBER 2020**
SUBJECT: **MEMO REPORT**

There were two hollows with a suitable entrance for black cockatoos but which had no signs of use. Photographs were taken of both of them and neither were good internally and are not cockatoo hollows. There were a few small parrot hollows. Australian Ringneck and Rainbow Lorikeets were present so they could be used by these species. The lack of hollows generally was surprising as there were some large trees.

The understorey was completely degraded with no native species. The only cockatoo food at the site would be nectar and seeds from the Flooded Gum. Forest Red-tailed Black Cockatoos (FRTBC) have been recorded feeding on the seeds and Carnaby's have been recorded taking nectar, but all in all they are not very important food species.

There were no roost sites evident and I was there until almost dark.

Six Carnaby's Cockatoos were observed overhead, heading east at 14:30.

There was still a family of Splendid Wrens surviving there (at the site).

A herd of 17 goats was also observed.

The following information is provided:

- Data sheet with diameter at breast height (DBH) data and hollow records.
- Photos.

Table 1: Site records

Point ref	Date	Coordinates GDA94	Tree species	Approximate DBH	Comments
263	3/09/2020	406368 6470303	<i>Eucalyptus rudis</i>	1500	No hollows suitable for black cockatoos
264	3/09/2020	406328 6470325	<i>Eucalyptus rudis</i>	700	No hollows suitable for black cockatoos
266	3/09/2020	406302 6470349	<i>Eucalyptus rudis</i>	1000,400,400	Multi trunked. No hollows suitable for black cockatoos
267	3/09/2020	406312 6470347	<i>Eucalyptus rudis</i>	1050	No hollows suitable for black cockatoos
268	3/09/2020	406313 6470352	<i>Eucalyptus rudis</i>	1800	Large DBH but forks into multi trunks. 500,500,500,600 DBH. No hollows suitable for cockatoos
269	3/09/2020	406321 6470343	<i>Eucalyptus rudis</i>	550	No hollows suitable for black cockatoos
270	3/09/2020	406323 6470359	<i>Eucalyptus rudis</i>	700	No hollows suitable for black cockatoos
271	3/09/2020	406323 6470368	<i>Eucalyptus rudis</i>	650	No hollows suitable for black cockatoos
272	3/09/2020	406251 6470377	<i>Eucalyptus rudis</i>	650	No hollows suitable for black cockatoos
273	3/09/2020	406249 6470377	<i>Eucalyptus rudis</i>	1200	Two trunks. 800,600 DBH. No hollows suitable for black cockatoos
274	3/09/2020	406244 6470372	<i>Eucalyptus rudis</i>	1100	Small hollow suitable for small parrot. Australian Ringneck, Rainbow Lorikeet seen at survey area
275	3/09/2020	406250 6470364	<i>Eucalyptus rudis</i>	550	No hollows suitable for black cockatoos
276	3/09/2020	406251 6470363	<i>Eucalyptus rudis</i>	500	No hollows suitable for black cockatoos
277	3/09/2020	406245 6470346	<i>Eucalyptus rudis</i>	900	No hollows suitable for black cockatoos
278	3/09/2020	406245 6470344	<i>Eucalyptus rudis</i>	600	No hollows suitable for black cockatoos
279	3/09/2020	406233 6470343	<i>Eucalyptus rudis</i>	1200	Large hollow with a good entrance for black cockatoos but is unsuitable internally. Floor appears uneven. No signs of use
280	3/09/2020	406239 6470338	<i>Eucalyptus rudis</i>	500	No hollows suitable for black cockatoos
281	3/09/2020	406215 6470365	<i>Eucalyptus rudis</i>	1100	No hollows suitable for black cockatoos
282	3/09/2020	406215 6470387	<i>Eucalyptus rudis</i>	1400	No hollows suitable for black cockatoos
283	3/09/2020	406214 6470399	<i>Eucalyptus rudis</i>	1200	No hollows suitable for black cockatoos
284	3/09/2020	406201 6470370	<i>Eucalyptus rudis</i>	1000	No hollows suitable for black cockatoos
285	3/09/2020	406189 6470375	<i>Eucalyptus rudis</i>	950	No hollows suitable for black cockatoos
286	3/09/2020	406189 6470378	<i>Eucalyptus rudis</i>	600	No hollows suitable for black cockatoos

Point ref	Date	Coordinates GDA94	Tree species	Approximate DBH	Comments
287	3/09/2020	406177 6470389	<i>Eucalyptus rudis</i>	1400	No hollows suitable for black cockatoos
288	3/09/2020	406180 6470395	<i>Eucalyptus rudis</i>	900	No hollows suitable for black cockatoos
289	3/09/2020	406183 6470420	<i>Eucalyptus rudis</i>	1000	No hollows suitable for black cockatoos
290	3/09/2020	406147 6470447	<i>Eucalyptus rudis</i>	1100	Two hollows. One with worn entrance but is too shallow for nest hollow. Feral bees in second hollow
291	3/09/2020	406140 6470455	<i>Eucalyptus rudis</i>	1200	Small hollow suitable for small parrot. Australian Ringneck, Rainbow Lorikeet seen at survey area
292	3/09/2020	406134 6470456	<i>Eucalyptus rudis</i>	700	No hollows suitable for black cockatoos. Has a depression in fork but is not a hollow and has grass growing from it
293	3/09/2020	406123 6470453	<i>Eucalyptus rudis</i>	500	No hollows suitable for black cockatoos
294	3/09/2020	406090 6470467	<i>Eucalyptus rudis</i>	900,600	Two stems. No hollows suitable for black cockatoos
295	3/09/2020	406122 6470461	<i>Eucalyptus rudis</i>	950	Small hollow suitable for small parrot. Australian Ringneck, Rainbow Lorikeet seen at survey area
296	3/09/2020	406077 6470456	<i>Eucalyptus rudis</i>	1000	No hollows suitable for black cockatoos
297	3/09/2020	406070 6470467	<i>Eucalyptus rudis</i>	550	No hollows suitable for black cockatoos
298	3/09/2020	406105 6470441	<i>Eucalyptus rudis</i>	600	No hollows suitable for black cockatoos
299	3/09/2020	406100 6470441	<i>Eucalyptus rudis</i>	1300	No hollows suitable for black cockatoos
300	3/09/2020	406125 6470445	<i>Eucalyptus rudis</i>	1100	No hollows suitable for black cockatoos
301	3/09/2020	406133 6470443	<i>Eucalyptus rudis</i>	800	No hollows suitable for black cockatoos
302	3/09/2020	406128 6470436	<i>Eucalyptus rudis</i>	600,500	No hollows suitable for black cockatoos
303	3/09/2020	406155 6470429	<i>Eucalyptus rudis</i>	900	No hollows suitable for black cockatoos
304	3/09/2020	406152 6470401	<i>Eucalyptus rudis</i>	1000	No hollows suitable for black cockatoos

Photographs



Figure 1: Tree 279 – hollow



Figure 2: Tree 279 – hollow



Figure 3: Tree 279 – hollow



Figure 4: Tree 279 – hollow



Figure 5: Tree 290 – hollow

Appendix C Strategen-JBS&G contaminated site report 2020

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City of Swan
Detailed Site Investigation
Workshop Avenue Alignment
Midland

11 December 2020

133,816 59422

JBS&G Australia Pty Ltd T/A Strategen-JBS&G

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Appendices

Appendix 1: DWER Basic Summary of Records

Appendix 2: Site photos

Appendix 3: Calibration certificates

Appendix 4: Soil sampling logs

Appendix 5: Laboratory documentation

Appendix 6: Aurora Environmental Management Plan – Western Paddock

Abbreviations

Abbreviation/acronym	Definition
%	Percent
°C	Degree(s) Celsius
µg/L	Microgram(s) per litre
µm	Micrometer
µS	Microsiemens
µS/cm ³	Micro-Siemens per cubic meter
ACM	Asbestos Containing Material
AF	Asbestos Fines
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASS	Acid Sulfate Soils
C ₆ -C ₃₆	Hydrocarbon chain length fraction
cm	Centimetres
COC	Chain of Custody
COPCs	Contaminants of Potential Concern
CSA	Contaminated Sites Auditor
DO	Dissolved Oxygen
DoH	Department of Health
DoW	Department of Water (now DWER)
DSI	Detailed Site Investigation
DQO	Data Quality Objectives
DWER	Department of Water and Environment Regulation (formerly DER and DoW)
EC	Electrical Conductivity
Eh	Redox Potential
FA	Fibrous Asbestos
GME	Groundwater Monitoring Event
ha	Hectare
IP	Interface Probe
ISO	International Organisation for Standardisation
km	Kilometre
L	Litres
LNAPL	Light Non-Aqueous Phase Liquids
LOR	Limit of Reporting
m	Metre
ml/min	Millilitres per minute
mAHD	Metres Above Australian Height Datum
MAR	Mandatory Auditors Report
MAH	Monocyclic Aromatic Hydrocarbons
mbgl	Meters below ground level
mg/L	Milligram(s) per litre
mV	Millivolts
NATA	National Association of Testing Authorities
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measures
NHMRC	National Health and Medical Research Council
NRMCMC	National Resource Management Ministerial Council
OC	Organochlorine
OP	Organophosphorus

Abbreviation/acronym	Definition
ORP	Oxygen Reducing Potential
PACM	Potentially Asbestos Containing Material
PAH(s)	Polycyclic Aromatic Hydrocarbon(s)
POS	Public Open Space
PSI	Preliminary Site Investigation
QA	Quality Assurance
QA/QC	Quality Assurance / Quality Control
QC	Quality Control
RPD	Relative Percentage Difference
TDS	Total Dissolved Solids
TRH	Total Recoverable Hydrocarbon

Executive Summary

Strategen-JBS&G have been commissioned by City of Swan (CMG) to undertake a Detailed Site Investigation (DSI) for the proposed alignment of Workshop Avenue from Lloyd Street to Centennial Place, Midland, Western Australia.

Objectives

A data gap analysis undertaken by Strategen in 2017, indicated uncertainty with respect to the contamination status of the soils along the alignment. This DSI has been prepared to confirm the contamination status of the land to ensure the soil and groundwater quality is compatible with the proposed landuse and there is no risk to human health or the environment from the disturbance of soils along the alignment during construction.

The site is currently classified under the *Contaminated Site Act* (2003) as remediated for restricted use (RRU), and therefore is suitable for use as a road.

Results

A total of 20 primary soil samples, one duplicate and one triplicate were collected from 10 test pits for the analysis of Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethyl-benzene, Xylene (BTEX) and trace metals (As, Cd, Cr, Cu, Hg, Ni, Pb & Zn). In addition, two soil samples were analysed for the presence of asbestos in soils and one sample for Polycyclic Aromatic Hydrocarbon (PAH).

Concentrations of target metals in all soil samples complied with the adopted NEPM HIL-D. Nickel and zinc concentrations exceeded the worst case NEPM EIL for areas of ecological significance. If a typical cation exchange (CEC) value of 10 cmolc/kg is used along with the average soil pH of 6, the measured concentrations comply with the NEPM EIL for areas of ecological significance.

Detectable concentrations of TRH-F2 (C₁₀-C₁₆ less Naphthalene) that exceeded the Ecological Screening Levels (ESLs) for areas of ecological significance were identified at five locations. To determine if these hydrocarbons were petroleum-based, silica gel clean-up was conducted. This reduced the detectable TRH-F2 to two samples. The presence of the low levels of TRH-F2 is not considered an environmental risk as mobilisation is most unlikely.

As a result of the presence of detectable levels of TRH, one sample TP03-0.1 was analysed for PAHs. Trace amounts of Fluorene and Phenanthrene were detected at concentrations below any guideline limits.

Asbestos fibres were detected in the two surface soil samples collected at test pit TP01 and TP02 (see photo in Appendix 2). The calculated weight for weight percentages complied with the DoH recommended level of <0.001%w/w. Visible ACM fragments were present in two small stockpiles of soil located just south of the road alignment, opposite the “Western Paddock” containment stockpile.

Existing material within the Western paddock is known to contain asbestos. To allow construction, a portion of this material will need to be removed either to a Class I special waste licenced landfill or used as controlled and appropriately managed fill within the project.

Conclusions and recommendations

Based on the field and analytical data acquired during this investigation the following conclusions and recommendations are provided:

- Soil quality was investigated across the proposed road alignment for the potential contaminants of concern associated with contaminated waste fill from the former Midland Railway Workshops. The results indicated the soils were free from significant contamination and no further investigation is required.
- The alignment will require the removal of existing contaminated material within the Western Paddock stockpile. Stockpiled material within the Western Paddock will require management if moved or used as controlled fill along the proposed road alignment.
- The risk to human health and the environment is considered low, providing adequate management protocols are adhered to as outline in Section 13.
- At the time of writing this report, complete source-pathway-receptor linkages were identified for human exposure to soil contaminants within the Western Paddock. These risks are considered manageable through the implementation of standard remediation management protocols (Section 13).
- In the alignment outside the Western Paddock, no complete source-pathway-receptor linkages were identified and contaminant concentrations were found to comply with adopted assessment guidelines.
- No further environmental investigation are required and the construction can proceed as long as the recommended management protocols are implemented.
- A Construction and Environmental Management Plan (CEMP) should be prepared that includes unexpected finds protocols, a dust and asbestos air quality monitoring plan, an asbestos management plan and a waste management plan. This CEMP should be implemented during all works within the proposed road alignment.
- An auditor report is not required; however, the City may wish to engage one to review this report.
- The acceptability of the reuse of the residual contaminated waste fill in a controlled manner along the alignment should be confirm with the DWER.

1. Introduction

Strategen-JBS&G have been commissioned by City of Swan (CMG) to undertake a Detailed Site Investigation (DSI) for the proposed alignment of Workshop Avenue from Lloyd Street to Centennial Place, Midland, Western Australia.

This DSI has been prepared to confirm the absence of significant contamination along the route of proposed Workshops Avenue. This DSI is based on the assumption the site will continue to be used as a road in a land area classified under the Contaminated Sites Act (2003) as Remediated for Restricted use (industrial/commercial purposes).

The proposed road alignment abuts of fractionally impinges on the Helena River Development Control Area to the south and therefore appropriate and careful management of the road construction will be required, to minimise any potential environmental impacts.

1.1 Background

In 2017, Strategen now Strategen-JBS&G prepared an Environmental Assessment and Management Strategy (EAMS) for the proposed Workshops Avenue for the then Metropolitan Redevelopment Authority. This EAMS identified several issues that required management as part of the construction of Workshops Avenue (Table 1, as per Strategen 2017). Key to the proposed management approach is the preparation of a Construction and Environment Management Plan (CEMP). The CEMP will address environmental issues during construction including:

- management of contaminated and acid sulphate soils (if these are present)
- management of potential impacts to surface waters during construction
- management of clearing and earthworks
- any on-site chemical & fuel storage and appropriate management
- waste management.
- Unexpected finds protocols

Table 1: Summary of potential environmental impacts and management

Environmental attributes	Key potential impacts	Management measures
Soils and geology	<ul style="list-style-type: none"> • potential for disturbance of contaminated soils during earthworks (if present) • impacts on soil, groundwater and surface water acidity if ASS are disturbed and not properly managed. 	<ul style="list-style-type: none"> • sampling and analysis to be undertaken to determine whether contaminated soils are present within the footprint • delineation of contaminated soils (if present) to determine management requirements • if contaminated material is encountered then a management plan will be developed which may include offsite removal to an approved licensed landfill • investigation and management of ASS will be undertaken be in accordance with DER guidance

Environmental attributes	Key potential impacts	Management measures
		<ul style="list-style-type: none"> preparation of a CEMP that addresses the management of contaminated soils (if required).
Hydrology	<ul style="list-style-type: none"> diversion of surface water flows the potential for increased flows of stormwater into Helena River and associated CCW during and following construction as a result of the increased area of hardstand and thus increased potential for erosion potential increase in the amount of sediment and dissolved pollutants entering Helena River and associated CCW during and following construction of the road. 	<ul style="list-style-type: none"> limiting clearing to the areas required for construction to minimise the potential for erosion ensuring appropriate and timely stabilisation of new earthworks to reduce erosion potential construction of a stormwater system that includes bioretention basins for pollutant removal and attenuation of stormwater flows.
Flora and vegetation	<ul style="list-style-type: none"> vehicle movements during construction and earthworks have the potential to create dust which may smother vegetation and introduce and spread exotic species, including weeds vegetation within the footprint is completely degraded. The removal of 1.55 ha of completely degraded vegetation is not considered to be a potentially significant impact to flora and vegetation a clearing permit will be required for construction of the road. 	<ul style="list-style-type: none"> areas not designated for clearing during the construction should be clearly marked with flagging tape inductions for all construction personnel outlining appropriate vehicle hygiene, waste disposal and bushfire prevention procedures a CEMP will be prepared before the commencement of the construction to manage indirect impacts to vegetation.
Fauna	<ul style="list-style-type: none"> clearing of trees will remove limited fauna habitat and could result in the loss of individual terrestrial fauna clearance of 0.97 ha of moderate- good quality foraging habitat for Carnaby's Black Cockatoo (CBC) and 0.05 ha of very poor quality foraging habitat for CBC (Figure 5) clearance of 29 potential CBC roosting trees the tree species present do not provide foraging, roosting or breeding habitat for BBC or FRTBC the site is outside the breeding range of CBC vehicle movements could result in the injury or fatality of individual terrestrial fauna, especially less-mobile species construction infrastructure and machinery have the potential to disturb fauna through noise, vibrations and light spill. <p>The potential impact to CBC is not considered to be significant because of the small area of relatively poor quality habitat to be cleared and the presence of an additional 191 potential roosting trees that will not be cleared in the survey area, adjacent to the footprint.</p>	<ul style="list-style-type: none"> trees not designated for clearing during the construction will be clearly marked inductions for all construction personnel outlining appropriate fauna management, vehicle hygiene, waste disposal, vehicle speed limits and bushfire prevention procedures a CEMP will be prepared before the commencement of the construction to minimise risk to fauna during construction.
Noise and dust	<ul style="list-style-type: none"> Given the distance from the Site to sensitive human receptors and the presence of other dust sources in the area, the impacts of dust and noise from construction are anticipated to be limited. 	<p>Impacts will be managed through:</p> <ul style="list-style-type: none"> use of dust suppression measures including water trucks to limit dust production ensuring works are undertaken between 7 am and 5 pm to minimise noise impacts.

1.2 Objectives

The objectives of the DSI were to:

1. Assess the nature and extent of contamination, if any, along the alignment.
2. Assess the future risk to human health and the environment from residual contamination (if any).

3. Satisfy the Department of Water and Environmental Regulation (DWER) and the Department of Biodiversity, Conservation and Attractions (DBCA) that the disturbance of site soils will not result in contamination of the adjacent Helena River Development Control Area.

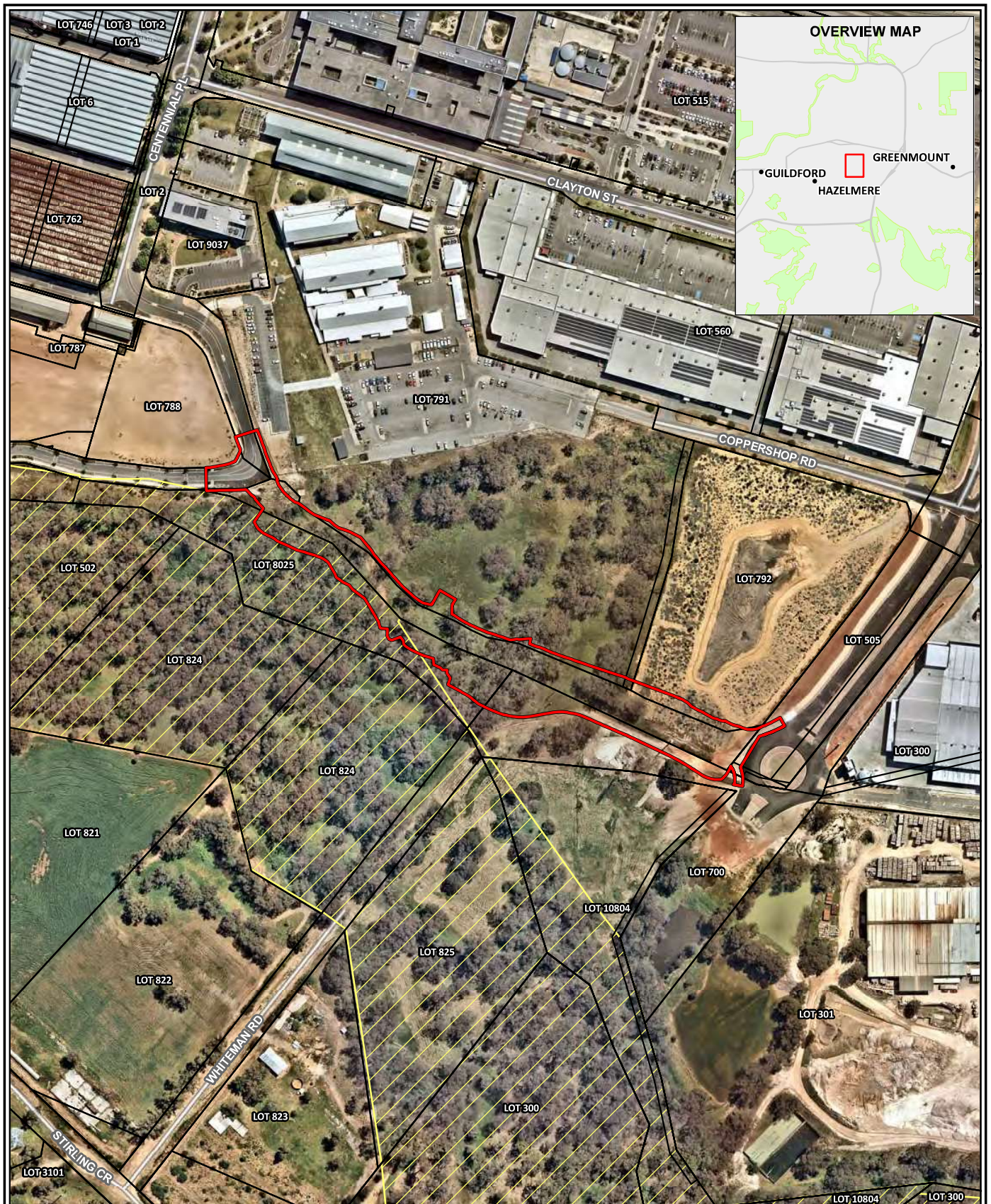
1.3 Scope of work summary

The scope of work completed as part of this DSI is summarised below:

- investigation of a total of 10 test pit soil sampling locations (TP01 to TP10) to a depth of 1.0 to 2m metres below ground level (mbgl), as shown on Figure 7.
- site walkover and inspection for signs of the presence of potential asbestos containing material (ACM)
- preparation of this DSI report.

Sampling, analysis and reporting has been completed in accordance with the following guidance documents:

- DWER 2014
- NEPM 2013
- Department of Health (DoH 2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*.



Legend Project area Swan Canning development control area Cadastral boundary Roads (MRWA)	Scale 1:3,500 at A4 0 25 50 metres Coord. Sys. GDA 1994 MGA Zone 50 Job No: 59422 Client: City of Swan Version: A Date: 24-Nov-2020 Drawn By: cthatcher Checked By: PB	Workshop Avenue City of Swan PROJECT AREA AND SITE LOCATION FIGURE 1
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2. Site identification

2.1 Site details

The site road reserve with the Landgate Pin of 12295720 and is Part of Lot 8025, Midland Workshops re-development area, which runs between Lloyd Street in the East and Centennial Avenue in the West and is located approximately 17 km east of the Perth CBD (Figure 1).

Site identification details are provided in Table 2 below.

Table 2: Site identification details

Identifier	
Lot address	Part Lot 8025, road reserve with the Landgate Pin of 12295720
Common name of the site	Workshops Avenue Road Reserve
Area	Approximately 4.9469ha of which 2.1476ha will be part of the proposed road.
Current certificate of title	N/A
Site Owner	DevelopmentWA
Local Government Authority	City of Swan
Current MRS zoning	Road reserve
Proposed MRS zoning	Road reserve
Current land use and status	Unused paddocks/bush
Proposed future use	Road

2.2 Contaminated Sites Register Search

The Basic Summary of Records (BSR) from the DWER shows the road reserve is classified under the Contaminated Site Act (2003) as “Remediated for Restricted Use”. The BSR is presented in Appendix 1. The land use of the site is restricted to the current (i.e. road reserve) land use with minimum soil access, which excludes sensitive uses with accessible soil such as childcare centres, kindergartens, pre-schools and primary schools. The site should not be developed for a more sensitive use such as recreational open space, residential use or childcare centres without further contamination assessment and/or remediation.

Other than for analytical testing, groundwater abstraction is not permitted at this site.

2.3 Surrounding land uses

Details of the surrounding land uses are summarised below:

- Lloyd Street and associated new commercial developments to the east
- Helena River and associated conservation category wetland within the flood plain to the south.
- Western Paddock contaminated soil stockpile in the eastern portion, north of the proposed road alignment
- Unused paddocks associated with the WA Police facility in the western portion, north of the proposed road alignment
- Proposed private hospital and carpark to the west.

3. Previous environmental investigations

Key previous environmental investigations that included the site are as follows:

- Environmental Investigations Midland Railway Workshops Eastern Sector, Egis Consulting, 1999.
- Western Paddock Environmental Management Plan WAPs Area B, Clayton Precinct, Former Midland Railway Workshops, Midland, Aurora Environmental, 2015
- Workshops Avenue, Midland – Environmental Assessment and Management Strategy, Strategen 2017

4. Environmental setting

4.1 Topography

Land along the alignment is generally flat with the exception of the western and eastern ends, where it rises up the flood plain embankment and ties into existing infrastructure. Land elevation range from approximately 8 metres Australian Height Datum (mAHD) to 11 mAHD. A significant amount of fill will be required to construct the proposed road to grade.

4.2 Geology and soils

The sites underlying geology has been obtained from the following (Figure 2):

- Geological Survey of Western Australia (1978): Perth: 1:50,000, Geological Series Map, Sheet SH2034, Geological Survey of Western Australia.

The soil type is mapped as CLAY - dark strong brown, hard when dry, soft when moist, variable silt content, no sand, of alluvial origin.

The soils encountered at the site during the sampling and analysis quality program were consistent with above description.

4.2.1 Acid sulfate soils

Acid Sulfate Soils (ASS) are naturally occurring, iron-sulphide rich soils, sediments or organic substrates, formed under waterlogged conditions. If exposed to air, these sulphides can oxidise and release sulphuric acid and heavy metals. This process can occur due to drainage, dewatering or excavation.

The DER ASS Risk Maps indicate that the site is located within an area of “moderate to low risk of Actual ASS (AASS) and Potential ASS (PASS) generally occurring at depths less than 3m (Figure 3).

4.3 Hydrology

4.3.1 Surface water and wetlands

The Helena River and associated conservation category wetlands are located immediately south and down hydraulic gradient of the proposed road (Figure 4). The wetlands and flood plain are subject to annual inundation during winter.

4.3.2 Flood potential

There is a small risk of major flooding in the event of a high rainfall year and the potential for the overflow of the Mundaring Weir and associated pump back dam in Helena Valley.

4.4 Hydrogeology

Investigations for the Midland Workshops Redevelopment, which includes the land proposed for the Workshop Avenue construction, demonstrate that the groundwater gradient and flow directions across the site is strongly affected by the relatively complex geology within the

Upper Clays Units of the Guildford Formation, as well as by the ability of rainfall to infiltrate the ground which correlates to the presence or absence of extensive hardstand areas (ATA 2006; Coffey Environments 2009).

Broadly, two superficial groundwater systems have been identified and investigated and comprise a complex shallow flow system perched within the Upper Clays, referred to as the Shallow Superficial Aquifer (SSA), and a deeper aquifer in the Lower Sands termed the Lower Superficial Aquifer (LSA). The LSA is in hydraulic continuity with the Henley Sandstone and essentially forms a single hydrogeological unit (Coffey Environments 2009, Aurora 2013). As indicated by drilling logs from the installation of production bores into the Leederville Formation at the MRA site (Crisalis 2006), the Henley Sandstone is underlain at depth by shale (interpreted as the Pinjar Member of the Leederville Formation), which varies in thickness from 2 m to 16 m in the broad vicinity of the Site. The Pinjar Member forms an aquiclude capping the extensive regional aquifer system in the underlying Leederville Formation (Davidson 1995).

The Helena River riverbed is scoured into clay-rich soils which overlie the LSA on the floodplain. It has been assumed by Aurora that the groundwater quality of the LSA does not significantly impact the Helena River as the LSA predominantly flows parallel to the Helena River. However, monitoring undertaken by Strategen indicates groundwater flow from the site may be intercepted by the river, even if only seasonally. Regardless of the interpolated groundwater flow direction, there are other multiple lines of evidence that indicate that the Helena River is ephemeral and not in hydraulic connection to the LSA, including:

- the reliance of rainfall for flow in the Helena River
- the relative water levels of the Helena River bed and the LSA
- electrical conductivity of the river compared to groundwater.

Based on the lines of evidence provided, and following a review of previous reports on Helena West hydrogeology (Crisalis 2006), groundwater from the LSA is not expected to impact the Helena River, as there is no complete groundwater migration pathway.

Work by Strategen (2015) indicated that groundwater flow in the LSA may be in a southerly to south-westerly direction (i.e. towards the Helena River). It should be noted that the October 2015 investigation did not extend across most of the land proposed for the construction of the Workshops Avenue and the relevance is only inferred.

4.5 Beneficial groundwater users

The regional groundwater is not suitable for potable uses. Groundwater is abstracted from the confined Leederville aquifer several locations in the vicinity of the proposed road; however, there is no hydraulic connection between the Leederville aquifer and the Lower Superficial Aquifer.

As per the discussion in Section 4.4, the contribution of the groundwater in the LSA to flow in the Helena River is questionable and not likely to be significant.

4.6 Flora and Fauna

The potential for contaminated soils impacting flora and fauna at the site is low. The Helena River conservation category wetland contains some scattered mature trees and typical riparian vegetation. Vegetation within the proposed road reserve (Figure 5) is considered degraded, with several mature flooded gums (*E.Rudis*) and several weed species.

The mature trees were surveyed for their potential as foraging and nesting habitat by Carnaby Black Cockatoos (Figure 6). The habitat was mapped as either Nil, Very Poor or Moderate-Good for Carnaby Black Cockatoos. A separate report is under preparation with respect to cockatoo habitat impacts and a clearing permit has been applied for.



Legend

Project area

Surface geology

Cm2
CLAY - dark strong brown, hard when dry, soft when moist, variable silt content, no sand, of alluvial origin

Mgs1
PEBBLY SILT - strong brown silt with common, fine to occasionally coarse-grained, sub-rounded laterite quartz, heavily weathered granite pebble, some fine to medium-grained quartz sand, of alluvial origin

Scale 1:3,500 at A4

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 50



Job No: 59422

Client: City of Swan

Version: A

Drawn By: cthatcher

Date: 27-Nov-2020

Checked By: PB

**Workshop Avenue
City of Swan**

SOIL AND GEOLOGY

FIGURE 2

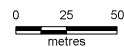




Legend

- Project area
- Acid sulfate soil (DWER)
- Moderate to low risk

Scale 1:3,500 at A4



Coord. Sys. GDA 1994 MGA Zone 50



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Drawn By: cthatcher

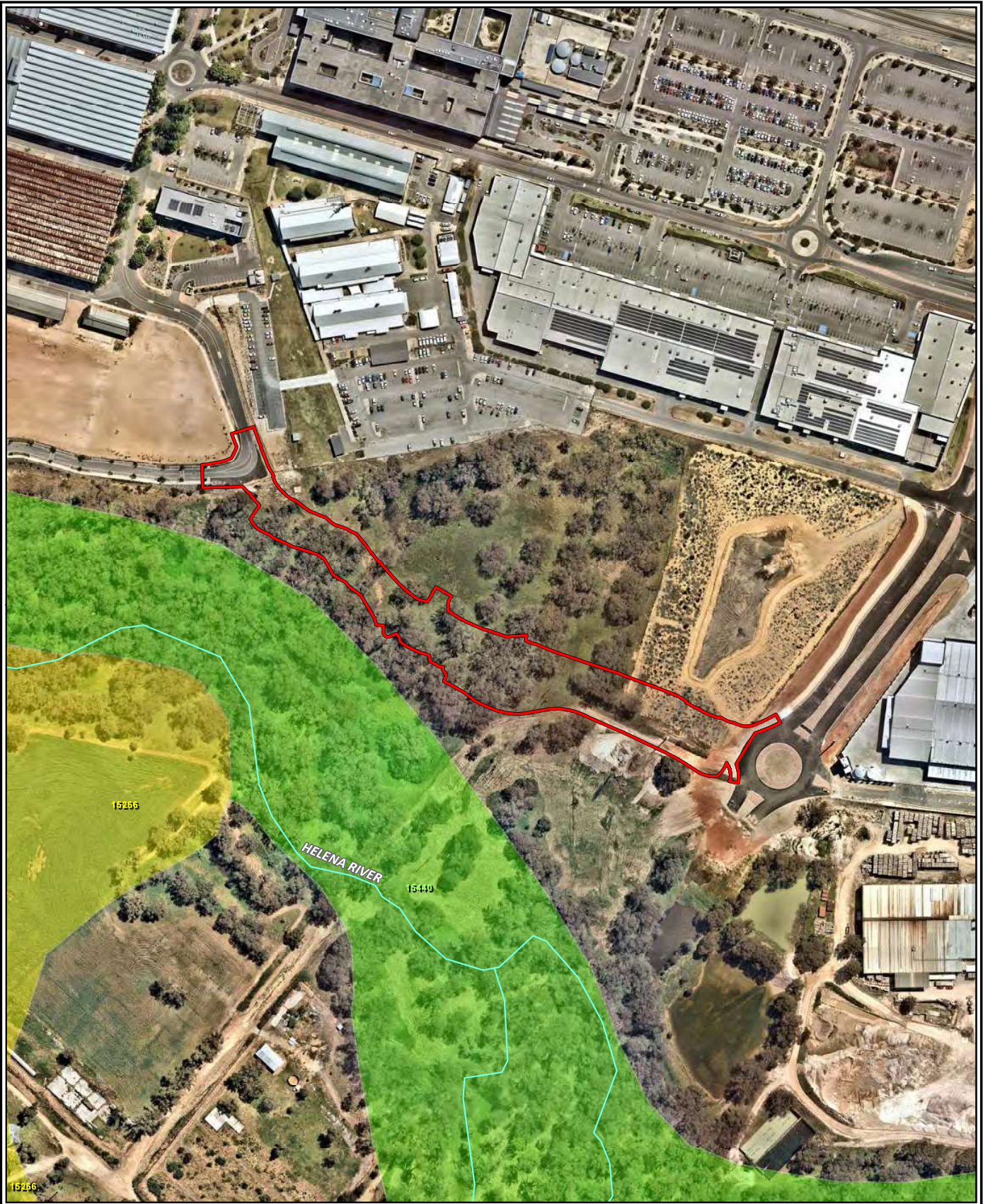
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**Workshop Avenue
City of Swan**

ACID SULFATE SOILS

FIGURE 3





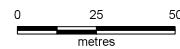
<div>Legend</div> <div><div></div> Project area</div> <div>Geomorphic Wetlands (DBCA)</div> <div><div></div> Conservation</div> <div><div></div> Multiple Use</div> <div><div></div> Watercourse</div>	Scale 1:3,500 at A4		<div><div>02550</div><div>metres</div></div>	<div>Workshop Avenue</div> <div>City of Swan</div> <div></div> <div>SURFACE HYDROLOGY AND WETLANDS</div>
	Coord. Sys. GDA 1994 MGA Zone 50		<div><div></div></div>	
	Job No: 59422			
	Client: City of Swan		FIGURE 4	
	<div>Version: A</div>	<div>Date: 24-Nov-2020</div>		<div><div></div><div>strategen</div><div>JBS&G</div></div>
<div>Drawn By: cthatcher</div>	<div>Checked By: PB</div>			



Legend

- Project area
- Vegetation type
 - VT1
 - VT2
 - Cleared
- Vegetation condition
 - Completely degraded

Scale 1:2,250 at A4



Coord. Sys. GDA 1994 MGA Zone 50



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Client: City of Swan

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Drawn By: cthatcher

Checked By: PB

**Workshop Avenue
City of Swan**

VEGETATION TYPE AND CONDITION

FIGURE 5

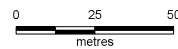




Legend

- Project area
- Black Cockatoo habitat
- Moderate-Good (CBC only)
- Very poor (CBC only)
- Nil

Scale 1:2,250 at A4



Coord. Sys. GDA 1994 MGA Zone 50



Job No: 59422

Client: City of Swan

Version: A

Date: 24-Nov-2020

Drawn By: cthatcher

Checked By: PB

**Workshop Avenue
City of Swan**

BLACK COCKATOO HABITAT

FIGURE 6



5. Preliminary Conceptual Site Model

A preliminary conceptual site model (CSM) was developed for the site which outlined identified potential sources – pathway – receptor linkages at the site based on the previous investigations undertaken at or surrounding the proposed road alignment.

5.1 Potential sources of contamination

The potential sources of contamination along the proposed road alignment are the contaminated waste fill that was disposed to the Western paddock, other stockpiles of uncontrolled fill material and any residual cinders etc that may have been disposed during the operation of the railway workshops.

The potential contaminants of concern include heavy metals, asbestos (ACM and fibrous asbestos, that can be found in the waste fill and possible petroleum hydrocarbons.

5.2 Potential pathways

An exposure pathway is the mechanism by which an ecosystem, human population or individual (receptor) may be exposed to site-derived contaminants. Exposure pathways are natural and/or man-made and based on a review of the site geology/hydrogeology and infrastructure.

Potential exposure pathways were determined based on the potential migration of contaminants through/from the soil type within the site which has a low permeability based on the described soil texture. Potential exposure pathways presented in the preliminary CSM for soil contaminants at the site include:

Human Health

- dermal contact with contaminated soil
- inhalation of airborne asbestos fibres potentially disturbed during site works
- exposure livestock to contaminated soils and subsequent consumption by humans and the resulting potential bioaccumulation of contaminants.

Environmental

- infiltration of rainfall and leaching of contaminants from the unsaturated soils to groundwater or direct runoff into the river/wetlands.
- potential plant uptake of contaminants.
- exposure of native fauna/livestock to contaminated soils and the potential bioaccumulation of contaminants.

5.3 Potential receptors

A receptor can be defined as persons, structures, utilities, ecological systems, water supplies etc, which may be adversely impacted through contact with, or exposure to, a contaminant.

The following potential receptors that may be impacted from potential soil and or groundwater impacts include:

- workers employed at the rendering facility
- visitors to the site
- workers involved in future site development, construction and excavation works
- future site occupants/users
- users of the nearby areas of environmental significance
- groundwater beneath the site
- adjacent surface water bodies.

5.4 Summary of preliminary CSM

The preliminary CSM describes the potential human health and environmental risks associated with the site. A risk is only present when the three components that constitute a risk are present; a contaminant source, a receptor and a pathway to link the source to the receptor. In summary, identified potential current and future complete linkages which warrants further investigation include:

- exposure of livestock to contaminated soil river water
- If asbestos is present, workers may potentially be exposed to respirable asbestos fibres during earthmoving activities
- workers may potentially be exposed via inhalation of vapours (such as those derived from hydrocarbons) during earthmoving or dewatering activities
- future occupants may be exposed to via direct contact or ingestion of potentially contaminated soil
- onsite plant uptake of contaminants from impacted soil
- leaching of contaminants to groundwater and potential transport to adjacent wetlands.
- Direct runoff of contaminants to the Helena River and associated wetlands

6. Data quality objectives

This section addresses Data Quality Objectives (DQOs) in accordance with DWER 2014 and NEPM 2013. DQOs are statements specifying the quality of the data required. DQOs are employed to define each step of decision-making necessary to facilitate the collection of data that is applicable to achieve the research objective. Utilisation of DQOs ensures data collected can be interpreted with a high level of confidence that analytical results accurately represent on-ground conditions.

The seven step DQO process is as follows:

1. State the Problem.
2. Identify the Decision.
3. Identify Inputs to the Decision.
4. Define the Boundary of the Assessment.
5. Develop a Decision Rule.
6. Specify Acceptable Limits on Decision Errors.
7. Optimise the Design for Obtaining Data.

6.1 State the problem

The key problem to be addressed is:

1. A road is proposed to run through the site. The CSM identifies several areas of environmental concern and potential complete source-pathway-receptor linkages. The land proposed for use as the road is classified as remediated for restricted use under the contaminated site act 2003 and a positive outcome from this investigation could enable site reclassification as decontaminated.

The problem addressed via this DSI include:

- is the site suitable for the proposed land uses with respect to contamination?
- Is there a risk to human health and/or the environment from exposure to identified contamination?
- will any complete contamination source-pathway-receptor linkages continue into the future?
- is remediation and/or management required to remove or isolate those linkages?
- are there any potential data gaps that may need to be further addressed?

6.2 Identify the decisions

The objectives of the DSI, with reference to the NEPM 2013 and DWER 2014 are to:

- assess the nature and extent of contamination, if any, at the site

- assess the future risk to human health and the environment from residual site contamination
- develop an appropriate remediation / management strategy for impacted soils or groundwater (if any).

Other decisions addressed by the DSI include the following:

- what complete source-pathway-receptor linkages exist following the incorporation of the data obtained through this DSI?
- is the field and laboratory data sufficient to address the objectives of the DSI?
- are additional investigations required to address the DSI objectives, or to determine the need for remediation and/or management to render the site suitable for the proposed development?
- are there any off-site migration issues that need to be considered further?
- is the data sufficient to enable appropriate decision to be made about the construction of the proposed road?

6.3 Identify inputs to the decision

The following inputs are required to reliably assess contaminant concentrations in soil and groundwater on-site and from off-site sources:

- findings and conclusions of the Environmental Assessment and Management Strategy (Strategen, 2017)
- the preliminary CSM which identified contaminant sources, contaminant migration pathways and receptors to site contaminants
- an understanding of the site's environmental characteristics, including but not limited to geology, hydrogeology and topography as well as site history and previous land uses
- site observations during the fieldwork
- a sufficient number of samples are collected to determine the extent of soil and or contamination (if any)
- field and laboratory methods and QC/QA data to assess the suitability of the data
- laboratory methodologies are to National Association of Testing Authorities (NATA) accreditation
- analytical results for the contaminants of potential concern in soil and water samples
- assessment of the analytical data against adopted assessment criteria.

6.4 Define the boundaries of the study

Site identification detailed are provided in Section 2. The media of interest includes surface material and soil and groundwater beneath the site. Spatial boundaries are shown on Figure 1.

Temporal boundaries are as current at the time of the investigation and the scale of the decision making is based on systematic sampling.

6.5 Develop a decision rule

The decision rules in addressing the objective of the DSI are as follows:

1. The appropriate soil and water assessment criteria was adopted.
4. Soil and water laboratory analytical results were assessed against the adopted assessment criteria.
5. Exceedances of investigation/assessment criteria triggered a review of the potential risks to human health and the environment, and where a potential unacceptable risk was identified, a recommendation was made for additional targeted investigation, remediation and/or management.
6. The QA/QC results were evaluated with respect to the specific limits.
7. The accuracy and precision of the field and laboratory analytical results was assessed.

6.6 Specify limits on decision errors

There are two main types of decision errors likely to result from this investigation as follows:

1. Type I: concluding that the investigation area is contaminated when it is not. This may result in unnecessary expenditure for further investigation and/or remediation.
2. Type II: concluding that the investigation area is not contaminated when it is. This may result in risks to human health and/or the environment.

Decision errors were minimised by the following:

1. Recommended sampling densities comply with DWER and NEPM guidelines.
2. The sampling and analysis program targets individual stratum identified as being impacted by the CSM to account for site variability.
3. Sampling methodologies were undertaken in accordance with standard industry practice.
4. Analyte selection is based on the CSM; the potential for presence of other contaminants is considered low.
5. Analysis will to be undertaken by NATA-accredited laboratories, with NATA endorsed testing procedures.
6. Assessment criteria/levels were adopted from current, relevant endorsed guidelines, which have risk probabilities incorporated.
7. Use of risk-based decision making, including development of a CSM, when determining the need for remediation or management of contamination.

This DQO establishes the decision maker's tolerable limits on decision errors, which are used to set performance goals for limiting uncertainty in the data. Data generated during this investigation must be appropriate to allow decisions to be made with confidence.

Specific limits for this project have been adopted in accordance with the appropriate guidance from National Environment Protection Council (NEPC 2013), appropriate indicators of data quality (DQIs used to assess quality assurance / quality control) and standard JBS&G procedures for field sampling and handling.

To assess the usability of the data prior to making decisions, the data was assessed against pre-determined Data Quality Indicators (DQIs) established for the project as discussed below in relation to precision, accuracy, representativeness, comparability and completeness and sensitivity (PARCCS parameters). The acceptable limit on decision error is 95% compliance with DQIs.

The DQIs and data assessment criteria are summarised in Table 3.

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted site assessment criteria.

Table 3: Summary of Quality Assurance / Quality Control Program

Data Quality Indicators	Frequency	Data Quality Criteria
Precision		
Split duplicates (intra laboratory)	1 / 20 samples	<50% RPD ¹
Blind duplicates (inter laboratory)	1 / 20 samples	<50% RPD ¹
Laboratory Duplicates	1 / 20 samples	RPD ¹ within range specified by lab
Accuracy		
Surrogate spikes	All organic samples	70-130%
Laboratory control samples	1 per lab batch	70-130%

Table 3: Summary of Quality Assurance / Quality Control Program

Data Quality Indicators	Frequency	Data Quality Criteria
Matrix spikes	1 per lab batch	70-130%
Representativeness		
Sampling appropriate for media and analytes	All samples	- ²
Samples extracted and analysed within holding times.	-	organics (14 days), inorganics (6 months)
Laboratory Blanks	1 per lab batch	<LOR
Trip spike	1 per lab batch	70-130% recovery
Storage blank	1 per lab batch	<LOR
Rinsate sample	1 per sampling event/media	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All samples	All samples
Standard analytical methods used for all analyses	All samples	NATA accreditation
Consistent field conditions, sampling staff and laboratory analysis	All samples	All samples ²
Limits of reporting appropriate and consistent	All samples	All samples ²
Completeness		
Sample description and COCs completed and appropriate	All samples	All samples ²
Appropriate documentation	All samples	All samples ²
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Analytical methods and limits of recovery appropriate for media and adopted Site assessment criteria	All samples	LOR<= assessment criteria

1. If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgment will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

2. A qualitative assessment of compliance with standard procedures and appropriate sample collection methods will be completed during the DQI compliance assessment.

6.7 Optimise the design for obtaining data

Soil sampling comprised systematic investigations, which were undertaken along the linear alignment of the proposed road reserve.

Field investigations were conducted in accordance with DWER 2014, NEPM 2013 and DoH 2009.

DQOs also comprised the following:

1. The investigation was undertaken by appropriately trained and experienced environmental scientists.
2. The sampling methods employed enabled the collection of representative samples.
3. NATA accredited laboratories using NATA endorsed methods were used for soil, groundwater and asbestos analysis.

7. Methodology

7.1 Soil investigation

The soil quality was investigated at ten locations (Figure 7) by excavating a test pit to a depth of 2m using a mini excavator.

Soil sampling and analysis was undertaken with reference to the following documents:

- DWER 2014
- NEPM 2013
- Standards Australia 1999: AS 4482.2. *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 2 Volatile and Semi-volatile Compounds*
- Standards Australia 2005: AS 4482.1. *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil Part 1 Non-volatile and Semi-volatile Compounds.*

Each sampling location was located using a hand-held GPS. Soil samples were collected to 1 mbgl at the following intervals:

- 0.0 to 0.15 mbgl
- 0.7 to 1.0 mbgl
- 1.7 to 2.0 mbgl.

Samples were placed into laboratory-prepared glass jars with Teflon lined lids by hand, ensuring minimal headspace within the jar. Sampling was undertaken using laboratory supplied sample jars while wearing dedicated nitrile gloves. The recovered soils were inspected for signs of potential contamination, soil texture and appearance, and recorded on soil profile logs.

The log included visual / olfactory indicators of potential soil contamination (i.e. discolouration, odour, etc.) and Photo Ionisation Detector (PID) measurements. Non-disposable sampling equipment was appropriately decontaminated between sample locations using phosphate free detergent (Decon 90), potable water and a deionised water rinse.

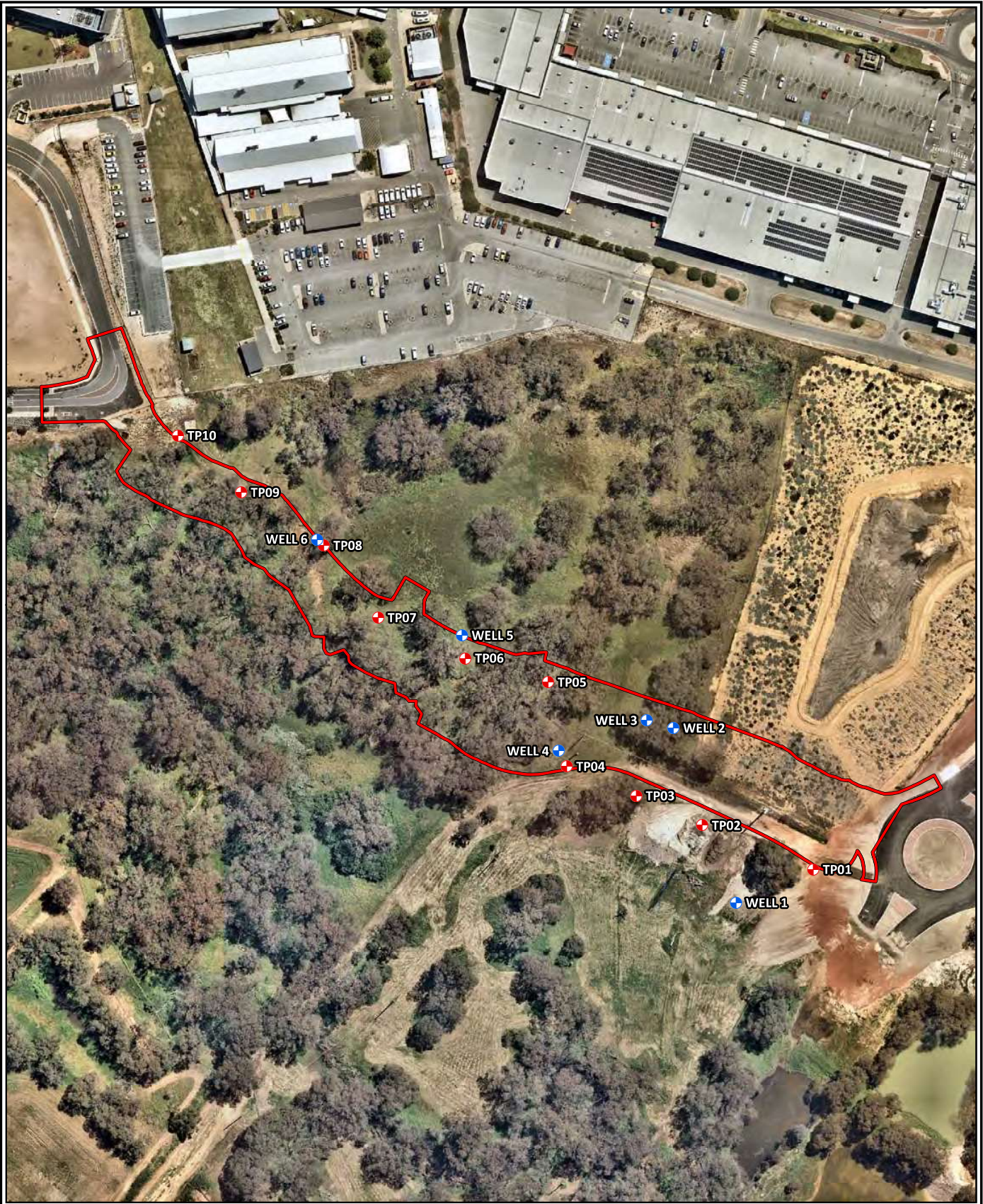
Samples were collected from the surface 0 to 0.15 mbgl, 0.7 to 1.0mbgl and 1.7 mbgl and 2.0 mbgl intervals of the soil profile. Samples collected at 0 to 0.15 mbgl and 0.7 to 1.0mbgl were sent for analysis. Samples collected between 1.7 mbgl and 2.0 mbgl were stored by the laboratory for possible future analysis. Test pitting was undertaken as follows:

- test pits were excavated / investigated using a track mounted mini excavator
- the soil profile was logged using the Australian Soil and Land Survey Field Handbook
- photographs (Appendix 2) were taken to document the types of fill / waste encountered
 - samples were collected at regular intervals down the test pit profile as well as the maximum extent of the test pit

- test pits were backfilled for safety purposes after investigation and the location pegged.

Soil samples collected were recorded on a Chain of Custody and sent to a NATA accredited laboratory for analysis within the specified holding times in a chilled esky.

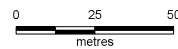
Strategen-JBS&G inspected the test pits for the presence of ACM fragments in accordance with the methodology outlined in Department of Health (DoH 2009). Minor amounts of ACM were identified in the soil stockpiles south of the proposed road alignment opposite the Western paddock (see test pit location TP02). 10L samples of soil were collected and sieved at test pit locations TP01 and TP02 (Figure 7).



Legend

- Project area
- + Monitoring well
- + Test pit

Scale 1:2,250 at A4



Coord. Sys. GDA 1994 MGA Zone 50



Job No: 59422

Client: City of Swan

Version: A

Drawn By: cthatcher

Date: 24-Nov-2020

Checked By: PB

**Workshop Avenue
City of Swan**

SAMPLING LOCATIONS

FIGURE 7



8. Data quality assurance and control program

A key process in ensuring the soil and groundwater data that was collected is appropriate, representative and adequate is the quality control sampling and testing that was undertaken. Quality control is practiced in the field and the laboratory.

To appropriately identify samples, the sampling containers were clearly labelled with a solvent free permanent marker at the time of collection with the following details:

- job reference number
- unique sample identification, i.e. 'TP01_0' or 'TMB10'
- date sample was taken
- initials of sampler
- Type of sample preservation (if any).

8.1.1 Sample collection, storage, preservation and transportation

Disposable nitrile gloves were worn when handling and collecting the samples. New gloves were worn for each sampling event. Reusable sampling equipment was decontaminated between each sample site.

Samples were placed in the applicable acid washed and/or sterilised sample containers provided by the laboratory. Sealed samples were kept cool via ice bricks in an insulated container (esky) and within a dedicated sample fridge at Strategen-JBS&G when stored overnight before submittal to the laboratory.

A chain of custody (CoC) form accompanied the samples during transport and delivery to the laboratory. The forms were signed by each individual responsible for the samples including Strategen-JBS&G and laboratory personnel. Sample receipt advice was obtained from the laboratory noting temperature and condition of samples on delivery.

8.1.2 Chain of Custody

The CoC forms which accompanied samples during transport and delivery included the following information:

- site identification and job reference number
- unique sample ID
- collection date
- name of sampler
- name of Project Manager
- requested analyses
- date and time and authorisation verifying release to the laboratory

- date and time and authorisation verifying acceptance from the laboratory.

The CoC was signed with the time and date recorded by each individual responsible for the relinquishment and receipt of the samples. The laboratory retained the original CoC and a duplicate issued to Strategen-JBS&G confirming arrival.

The receiving laboratories advice included the following information:

- condition in which the samples were received and appropriate container type
- cross checking information on sample IDs and CoC
- confirmation of preservation method.

8.1.3 Calibration records

All field equipment was rented from providers, who calibrated the equipment in accordance with the instrument's manual. Records of calibration are provided in Appendix 3.

8.1.4 Equipment decontamination

All repeat-use sample collection equipment was subjected to rigorous decontamination procedures to prevent cross-contamination of samples. Equipment was decontaminated between sampling locations by washing in a mixture of phosphate free detergent (Decon 90) and tap water, rinsing in tap water and then rinsing thoroughly with deionised water.

Equipment subject to decontamination included:

- interface probe
- low-flow peristaltic pump
- water quality meter flow-through cell.

Disposable / single-use equipment, such as nitrile gloves, HDPE tubing, bladders and filters, were replaced after each sampling location.

8.1.5 Field duplicates and triplicates

Duplicate samples – a replicate sample of the same soil matrix or groundwater (it should match the original or primary sample). The duplicate sample was analysed at the same laboratory as the primary sample. The duplicate sample was collected at a minimum rate of one per 20 primary samples submitted for analysis.

Triplicate samples – a replicate sample of the same soil matrix or groundwater (it should match the original or primary sample). A triplicate sample is analysed at a different laboratory to the primary sample and it allows an inter-laboratory comparison. The triplicate samples was collected at a minimum rate of one per 20 primary samples submitted for analysis to a third-party laboratory.

8.1.6 Field rinsates

A rinsate blank is a sample of water that has been used to rinse an item of sampling equipment to show there is no potential for cross-contamination.

A daily rinsate sample was collected following the decontamination of sampling equipment to check for any cross-contamination from the sampling equipment.

8.1.7 Analytical methods and accreditation

NATA accredited laboratories were engaged to perform all primary, duplicate and triplicate, and blank sample analyses.

Strategen-JBS&G requires that laboratories have a Quality Assurance System including a Quality Control and Quality Assessment program that is endorsed by NATA.

The laboratory must be able to demonstrate the following as specified in Schedule B3 of the NEPM 2013:

- freedom from contamination
- method accuracy and precision is reliably achieved
- conformance to the performance characteristics expected of the method
- confidence in the results produced.

The laboratory must be able to achieve the following criteria as specified in Schedule B3 of the NEPM 2013:

- Relative Percent Differences (RPDs) between original and duplicate samples: $<5 \times \text{PQL}$ - any RPD is acceptable; $>5 \times \text{PQL}$ - 0–30% (organics) and 0–50% (inorganics) RPD is acceptable
- Matrix Spike and Laboratory Control Samples: generally, 70–130% for inorganics/metals; 60–140% for organics, 10–140% for SVOC and Speciated Phenols, and 40–120% for low level organics
- Surrogates: 60–140% is acceptable for organics and 10–140% for SVOC and Speciated Phenols
- contaminant concentrations in blanks to be at or below the nominated limits of detection.

The RPD calculation is used to normalise each pair of results to allow for better QA/QC data interpretation. For those RPD values, which exceed a generally acceptable 30–50%, data correlation is considered poor; however, consideration needs to be given to sample homogeneity and the concentrations detected.

The laboratory would normally be required to meet these criteria before reporting results to Strategen-JBS&G. In some circumstances if the RPD% or the spike recovery rate exceed the relevant threshold, but the measured concentrations are close to the detection limit and well below guideline concentrations, the laboratory may not be required to re-analyse the sample. If the calculated RPD exceeds 30–50%, then the highest value is used for assessment purposes.

8.1.8 Laboratory procedures

A summary of the laboratory methods, detection limits and holding times to be applied during this program was provided in the Certificates of Analysis by the laboratories. These are provided in Appendix 5.

8.1.9 Analytical data validation

Analytical data validation is the process of assessing whether data complies with the method requirements and project specifications. This process is designed to ensure that data of known and pre-determined quality are reported, and to identify if the data can be used to fulfil the overall project objectives.

Laboratory quality control data was reviewed prior to interpreting analytical results to ensure they were of an acceptable quality. This included checking data against field observations to identify any results that were inconsistent with field data, and checking for any analytical errors, such as contamination identified in blanks, which may indicate cross-contamination. Other items that were reviewed include the following:

- preservation and storage of samples upon collection and during transport to the laboratory
- holding times
- use of appropriate analytical procedures
- required limits of reporting, to ensure all LOR were below the adopted guidelines
- frequency of conducting quality control measurements
- laboratory blanks
- field duplicates (RPD)
- internal laboratory duplicates (RPD)
- matrix spike/matrix spike duplicates (MS/MSDs) (spike percentage recoveries [%R])
- surrogates (or System Monitoring Compounds) (%R)
- external check standards
- occurrence of apparently unusual, inconsistent or anomalous results.

9. Quality assurance and quality control data evaluation

9.1 Analytical methods and accreditation

Upon receipt, analytical reports were assessed by Strategen-JBS&G to ensure that the data was sufficient to meet the overall data quality objectives.

ARL and MPL laboratories were used. These laboratories are both NATA accredited for all analysis performed. The methodologies used are detailed in the laboratory certificates of analysis contained in Appendix 5.

The soil sampling program involved the analysis of:

- 20 primary soil samples (TP-01 to TP-10, Figure 7Error! Reference source not found.)
- one duplicate sample (QC01)
- one triplicate samples (QC02)
- one rinse sample (QC03).

9.2 Laboratory quality control data

Laboratory QC data is presented within each laboratory certificate of analysis (Appendix 5). A summary of laboratory QC results are summarised below:

- all laboratory duplicate sample RPDs were within laboratory acceptance criteria
- no method blank value outliers occurred
- no laboratory control sample outliers occurred.

9.3 Sample holding times

Laboratory analyses were undertaken within the recommended holding times.

9.4 Laboratory limits of reporting

The LOR were all lower than the adopted assessment criteria.

9.5 Field QA/QC data evaluation

In accordance with the quality assurance and quality control requirements, field duplicates / triplicates were collected for every batch of twenty soil samples as a minimum for analysis. Rinsate samples were collected at a rate of one per field day for each sampling event that used equipment needing decontamination.

9.5.1 Field duplicates and triplicates

One duplicate and one triplicate soil samples were collected and analysed for all or a combination of the same suite of analytes as their primary samples. All Relative Percentage Differences (%RPD) were within the adopted 35% (organics) and 50% (inorganics) criteria.

10. Adopted assessment criteria

10.1 Soils

To assess the relative level and significance of any detected contaminants, reference was made to one or more established environmental and/or human health investigation and screening levels. These levels provided the basis of a Tier 1 ecological and human health risk assessment to determine if measured contaminant concentrations warrant further investigation or development of an appropriate management strategy.

10.1.1 Health investigation levels

Health investigation levels (HILs) have been developed for a broad range of metals and organics other than petroleum hydrocarbons. The HILs are applicable for assessing human health risk via all relevant pathways of exposure.

Based on the proposed use of the site for the construction of a road, soil analysis results were compared with the HIL-D – for industrial/commercial (NEPM 2013).

10.1.2 Health screening levels

Petroleum hydrocarbons

Health screening levels (HSLs) have been developed for selected petroleum hydrocarbon compounds and fractions and are applicable to assessing human health risk via inhalation and direct contact pathways. HSLs are applied to soil depths of up to 4 mbgl and are dependent on specific soil physiochemical properties, land use scenarios and the characteristics of building structures.

The soil HSLs for direct contact and vapour intrusion are provided in the Schedule B1 of NEPM 2013. proposed use of the site for the construction of a road and the soil profile encountered (fine grained sand) soil analysis results were compared with the HSL-D – for commercial/ industrial land.

10.1.3 Ecological investigation levels/Ecological Screening Levels

Ecological investigation levels (EILs) Ecological Screening Levels (ESLs) have been developed for a broad range of metals and organics compounds. The EILs/ESLs are applicable for assessing ecological risk via all relevant pathways of exposure.

Based on the presence of the conservation category wetland immediately to the south of the proposed road alignment, soil analysis results were compared with the EILs/ESLs – for sensitive ecological communities (NEPM 2013).

10.2 Asbestos in soils

Asbestos in soils were compared to the Department of Health (DoH, 2008) guideline of <0.001 w/w. for all land uses.

10.3 Application of guideline values

HILs/HSLs define conservative values to protect human health and reflect levels that would have no observable adverse effect on human health for the specified landuse.

EILs/ESLs define conservative values to protect ecological health and reflect levels that would have no observable adverse effect ecological impacts for the specified landuse.

The soil and groundwater guideline values adopted are appropriate within the context of the potential contaminants of concern, contaminant pathways, surrounding receptors and current and surrounding land use and zoning.

Contaminants of concern with levels that comply with nominated investigation assessment levels, may be inferred as safe no further investigation or management (remediation) will be required. Contaminant levels that exceed the investigation levels do not imply that soils or waters are hazardous but signal that further investigation or assessment of the risk from contamination to human and ecological receptors should be considered including assessing the requirement for further investigation, management and/or remediation (and validation).

10.4 Existing contaminated soils in the Western Paddock

As can be seen from Figure 1, the proposed road alignment will involve the removal of a portion of the contaminated soil stockpile known as Western Paddock. The material within western paddock is well characterised through previous investigations by Aurora Environmental and Strategen. Consequently, no further sampling and analysis of this material was undertaken. The historical results have been collated in a table in Section 11.

11. Results

11.1 Soil description

Soils were generally logged as red-brown-yellow medium plasticity sandy clays. In test pits TP04-TP09, a humus topsoil layer was present. Apart from some ACM fragments adjacent to test pits TP01 and TP02, soils appeared free from indicators of contamination such as odour, staining or discolouration (Appendix 4).

11.2 Soil contaminants - analysis results

A total of 30 primary soil samples were collected from 10 test pits, with the surface (0 - 0.15m) and 0.7-1.0m interval of soil profile selected for analysis following inspection of the soil profile.

- heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb & Zn),
- Total recoverable hydrocarbons (TRH) plus Benzene, Toluene, Ethyl-benzene, Xylene and Naphthalene (BTEXN). The remaining samples were stored in the laboratory, pending the results of the surface samples.
- Additional analysis was undertaken on several samples where TRH was detected

Soil analysis results have been tabulated and compared to the adopted soil quality criteria.

All laboratory documentation (CoCs, Sample receipt notices, Certificates of Analysis laboratory QAQC etc) are presented in Appendix 5.

Analytical results are summarised below.

11.2.1 Metals

Table 4 presents the results of heavy metal analysis for Area A. Concentrations of all target metals in all soil samples were less than the adopted NEPM HIL-D and most conservative commercial/industrial EIL criteria. Results are summarised as follows:

- Arsenic and cadmium were not detected
- Low levels of chromium, copper, lead and mercury were detected in most samples
- Concentrations of Nickel and Zinc exceeded the generic worst-case EIL for sensitive ecological receptors.

11.2.2 Hydrocarbons (TRH and BTEX-N)

Table 5 presents the total recoverable hydrocarbon analysis results. TRH were detected at five locations (TP03, TP06, TP07, TP08 & TP09). Concentrations of F2 (C₁₀-C₁₆ less Naphthalene) exceeded the ESL guideline for areas of ecological significance. To determine whether the detected hydrocarbons were primarily petroleum-based, silica gel clean-up on the samples was undertaken. Using this technique, only two (TP03-0.1 & TP09-0.1) of the five samples did not comply with the criteria. No hydrocarbon odour was noted. The silica gel F2 concentrations at TP03-0.1 exceeded the ESL for areas of ecological significance by 4.4-fold and 1.2-fold, respectively.

Table 4: Heavy Metals Analysis Results

15/09/2020	Arsenic mg/kg	Cadmium mg/kg	Chromium mg/kg	Copper mg/kg	Lead mg/kg	Mercury mg/kg	Nickel mg/kg	Zinc mg/kg
ARL Limit of Reporting (LOR)	5	0.1	1	1	1	0.02	1	1
HILs Comm/Ind D Soil	3000	900	3600	240,000	1500	730	6000	400,000
Generic EIL - Ecological Significance	40	ng	60	20	470	ng	5	15
Generic EIL - Comm/Ind	160	ng	310	85	1800	ng	55	110
TP01-0.1	<5	<0.1	8	15	49	0.05	1	9
TP01-2.0	<5	<0.1	19	<1	17	0.04	6	3
TP02-0.1	<5	<0.1	22	15	39	0.04	6	37
QC01	<5	<0.1	16	20	35	0.04	6	44
RPD %	na	na	32%	29%	11%	0%	0%	17%
QC02	5	<0.4	20	17	42	<0.1	8	43
RPD %	na	na	10%	13%	7%	na	29%	15%
TP02-2.0	<5	<0.1	21	3	21	0.02	8	3
TP03-0.1	<5	<0.1	13	6	15	0.03	5	33
TP03-1.0	<5	<0.1	21	<1	17	0.03	7	4
TP04-0.1	<5	<0.1	13	6	19	0.02	5	25
TP04-2.0	<5	<0.1	12	<1	12	<0.02	4	2
TP05-0.1	<5	<0.1	16	6	21	0.03	6	13
TP05-1.0	<5	<0.1	20	<1	16	0.02	7	2
TP06-0.1	<5	<0.1	23	8	20	0.03	8	30
TP06-2.0	<5	<0.1	22	3	26	0.02	7	3
TP07-0.1	<5	<0.1	14	9	28	0.04	5	48
TP07-2.0	<5	<0.1	22	1	15	<0.02	6	3
TP08-0.1	<5	<0.1	12	2	16	<0.02	3	19
TP08-0.6	<5	<0.1	21	2	30	0.03	5	5
TP09-0.1	<5	<0.1	22	12	51	0.04	6	37
TP09-2.0	<5	<0.1	16	3	19	<0.02	6	4
TP10-0.1	<5	<0.1	5	<1	3	<0.02	<1	3
TP10-2.0	<5	<0.1	9	<1	5	<0.02	<1	11
Statistical Summary								
Number of Detects	1	0	22	16	22	15	20	22
Minimum Concentration	5	0	5	1	3	0.02	1	2
Maximum Concentration	<5	<6	<7	<8	<9	<10	<11	<12
Average Concentration	5	na	16.68	8	23.5	0.032	5.8	17.3
Median Concentration	5	na	17.5	6	19.5	0.03	6	10
Standard Deviation	na	na	5.29	6.04	12.89	0.01	1.71	16.45
Number of Guideline Exceedances	0	0	0	0	0	0	12	9

bold denotes detected, ng denotes no guideline, na denotes not applicable, RPD denotes relative percentage difference
green shading denotes exceeds generic EIL - Areas of ecological significance

Table 5: Total Recoverable Hydrocarbons and BTEXN Analysis Results

15/09/2020	TRHs (NEPC 2013)										BTEXN				
	C6-C10	C10-C16	C16-C34	C34-C40	F1 (C6-C10 minus BTEX)	F2 (C10-C16 less Naphthalene)	>C10-C16	>C16-C34	F1 (C6-C10 minus BTEX)	F2 (C10-C16 less Naphthalene)	Benzene	Toluene	Ethylbenzene	Xylene Total	Naphthalene
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ARL Limit of Reporting (LOR)	2	20	50	2	20	20	50	50	2	20	0.1	0.1	0.1	0.2	0.1
Comm/Ind D Soil HSL for Vapour Intrusion, Sand	ng	ng	ng	ng	260	ng	ng	ng	260	ng	3	ng	ng	230	ng
0-1m	ng	ng	ng	ng	370	ng	ng	ng	370	ng	3	ng	ng	ng	ng
1-2m	ng	ng	ng	ng	630	ng	ng	ng	630	ng	3	ng	ng	ng	ng
2-4m	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	3	ng	ng	ng	ng
Generic EIL - Areas of Ecological Significance	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	10
Generic EIL - Comm/Ind	ng	ng	ng	ng	125	25	ng	ng	ng	ng	8	10	1.5	10	370
ESLs for Areas of Ecological Significance, Coarse Soil	ng	ng	ng	ng	125	25	ng	ng	ng	ng	8	10	1.5	10	ng
ESLs for Comm/Ind, Coarse Soil	ng	ng	1700	3300	215	170	ng	1700	3300	215	75	135	165	180	ng
TP01-0.1	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP01-2.0	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP02-0.1	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
QC01	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
RPD%	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
QC02	<25	<50	na	<25	<50	na	-	-	-	-	<0.2	<0.5	<1	<2	<1
RPD%	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
TP02-2.0	<2	<20	<50	<50	<2	<20	na	na	na	na	<0.1	<0.1	<0.1	<0.2	<0.5
TP03-0.1	<2	170	410	60	<2	170	110	<50	<50	<2	110	<0.1	<0.1	<0.1	<0.2
TP03-1.0	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP04-0.1	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP04-2.0	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP05-0.1	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP05-1.0	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP06-0.1	<2	40	<50	<50	<2	40	<20	<50	<50	<2	<20	<0.1	<0.1	<0.1	<0.2
TP06-2.0	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP07-0.1	<2	40	70	<50	<2	40	<20	<50	<50	<2	<20	<0.1	<0.1	<0.1	<0.2
TP07-2.0	<2	<20	<50	<50	<2	<20	30	<20	<50	<2	<20	<0.1	<0.1	<0.1	<0.2
TP08-0.1	<2	30	<50	<50	<2	30	<20	<50	<50	<2	<20	<0.1	<0.1	<0.1	<0.2
TP08-0.6	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP09-0.1	<2	60	140	<50	<2	60	30	<50	<50	<2	30	<0.1	<0.1	<0.1	<0.2
TP09-2.0	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP10-0.1	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
TP10-2.0	<2	<20	<50	<50	<2	<20	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.5
Statistical Summary															
Number of Detects	0	5	3	1	0	5	2	0	0	0	2	0	0	0	0
Maximum Concentration	na	170	410	60	0	170	110	0	0	0	110	0	0	0	0
Average Concentration	na	68	207	60	na	68	70	na	na	na	70	na	na	na	na
Median Concentration	na	40	140	60	na	40	70	na	na	na	70	na	na	na	na
Standard Deviation	0	56.1	178.5	na	na	56.1	95.6	na	na	na	56.6	na	na	na	na
Number of Guideline Exceedances	0	0	0	0	0	5	0	0	0	0	2	0	0	0	0

bold denotes detected, ng denotes no guideline, na denotes not applicable, RPD denotes relative percentage difference, purple shading denotes exceeds course soil ESLs - Areas of ecological significance

11.2.3 Polycyclic Aromatic Hydrocarbons (PAHs)

As a result of the presence of petroleum hydrocarbons in test pit TP03, it was considered prudent to test the sample TP03-0.1 for Polycyclic Aromatic Hydrocarbons (PAHs). Table 6 presents the results. The only PAHs detected were Acenaphthylene, Fluorene, Phenanthrene at concentrations marginally higher than the analytical limit of reporting (LOR). Concentrations compiled with applicable human health and ecological criteria.

Table 6: PAH Analysis Results

15/09/2020		LOR	HILs Comm/Ind D	ESLs Ecological Significance	ESLs Comm/Ind	TP03-0.1
2-Methylnaphthalene	mg/kg	0.1	ng	ng	ng	<0.1
Acenaphthene	mg/kg	0.1	ng	ng	ng	<0.1
Acenaphthylene	mg/kg	0.1	ng	ng	ng	0.1
Anthracene	mg/kg	0.1	ng	ng	ng	<0.1
Benz(a)anthracene	mg/kg	0.2	ng	ng	ng	<0.2
Benzo(a) pyrene	mg/kg	0.2	ng	0.7	1.4	<0.2
Benzo(b)fluoranthene	mg/kg	0.2	ng	ng	ng	<0.2
Benzo(g,h,i)perylene	mg/kg	0.2	ng	ng	ng	<0.2
Benzo(k)fluoranthene	mg/kg	0.2	ng	ng	ng	<0.2
Chrysene	mg/kg	0.2	ng	ng	ng	<0.2
Dibenz(a,h)anthracene	mg/kg	0.2	ng	ng	ng	<0.2
Fluoranthene	mg/kg	0.1	ng	ng	ng	<0.1
Fluorene	mg/kg	0.1	ng	ng	ng	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	ng	ng	ng	<0.2
Phenanthrene	mg/kg	0.1	ng	ng	ng	0.3
Pyrene	mg/kg	0.1	ng	ng	ng	<0.1
bold denotes detected, ng denotes no guideline.						

11.3 Asbestos

Two samples were collected for the analysis of asbestos fines or fibrous asbestos in soils. These samples were collected in accordance with the DoH 2008 guidelines by sieving a 10L composite samples of material from each test pit (TP01 and TP02 separately) and obtaining a subsample of the sieved material (<2mm), which was subsampled for asbestos in soils analysis using a polarising stereo microscope. Chrysotile Asbestos Fibre Bundles < 1mg were detected along with organic fibres. A weight for weight (w/w) calculation based on the weight of asbestos detected versus the weight of the sub sample of dry soil showed that there was less than 0.001% asbestos, which complies with the DoH guideline (Table 7).

Whilst shown to comply with guidelines, the presence of asbestos suggests there should be an unexpected finds protocol written into the Construction and Environment Management Plan (CEMP) so the contractor selected to build the road can make a suitable allowance for the potential management of asbestos and ensure the proper health and safety protocols are in place prior to undertaking site works. Consideration should be given to disposing the two stockpiles of uncontrolled fill material to an appropriately licenced landfill or reusing the material in a controlled manner as road base (assuming it is geotechnically suitable). Further testing to characterise the material in the stockpiles is required, which would involve testing for leachability and total concentrations of some key potential contaminant of concern.

Table 7: Asbestos in soil analysis results

15/09/2020	sample weight (g)	sub-sample weight (g)	weight of asbestos detected (mg)	Approximate % Asbestos w/w	Description
TP01-0.1	560	120	<1	<0.001%	Chrysotile Asbestos Detected Fibre Bundles < 1mg Organic Fibres Detected
TP02-0.1	420	130	<1	<0.001%	Chrysotile Asbestos Detected Fibre Bundles < 1mg Organic Fibres Detected

11.4 Acid Sulfate Soils

11.4.1 Soil pH

To assess the potential for acid sulfate soils at the soil pH_f and the pH_{fox} following oxidation of the soil sample in a hydrogen peroxide solution, were measured by the laboratory. Table 8 presents the pH_f and pH_{fox} results. The soils are naturally slightly acidic to neutral and upon oxidation display a moderate acidity.

As a rule, pH_f readings >4 may indicate the absence of 'actual' ASS but 'potential' ASS may still be present. pH_f readings <4 , indicates that actual ASS are present with the sulfides having been oxidised in the past, resulting in acid soils (and acid soil pore water). A pH_{fox} of <4 combined with a difference between pH_f and pH_{fox} that is greater than 2 pH units indicates the greatest potential for acidification. These samples were subject to further testing to determine the amount of lime required to neutralise the soil if required.

Table 8: pH_f and pH_{fox} results

15/09/2020	pH_f	pH_{fox}	ΔpH
TP01-0.1	7.7	5.4	2.3
TP01-1.0	6	4.4	1.6
TP01-2.0	5.8	4.2	1.6
TP02-0.1	6.9	4	2.9
TP02-1.0	5.9	4.7	1.2
TP02-2.0	5.5	4.2	1.3
TP03-0.1	6.6	4.3	2.3
TP03-1.0	5.6	4.2	1.4
TP03-2.0	6	4.3	1.7
TP04-0.1	6.3	3.9	2.4
TP04-0.5	5.9	4.2	1.7
TP04-2.0	5.7	4.1	1.6
TP05-0.1	5.4	3.5	2
TP05-1.0	5.2	4	1.2
TP05-2.0	5.6	4.3	1.3
TP06-0.1	6.3	4.3	2
TP06-0.6	5.8	4.3	1.5
TP06-2.0	6.4	6.3	0.1
TP07-0.1	6.2	4	2.2
TP07-1.0	5.6	4.1	1.5
TP07-2.0	5.2	3.9	1.3
TP08-0.1	7.5	5.7	1.8
TP08-0.6	7.2	5.3	1.9
TP08-2.0	5.5	4.1	1.4
TP09-0.1	5.7	3.4	2.3
TP09-1.0	5.8	4.9	0.9
TP09-2.0	5.4	4.4	1
TP10-0.1	7.3	5	2.3
TP10-1.0	7.5	5.3	2.2
TP10-2.0	8.1	5.9	2.2
Statistical Summary			
Number of Results	30	30	
Number of Detects	30	30	
Minimum pH	5.2	3.4	
Maximum pH	8.1	6.3	
Average pH	6.2	4.5	
Median pH	5.9	4.3	
Standard Deviation pH	0.8	0.69	

11.4.2 SPOCAS and CRS

Table 9 presents the Suspension Peroxide Oxidation Combined Acidity and Sulphur (SPOCAS) results. The results indicate a liming rate of between 1 and 7 kg CaCO₃/t of soil requiring treatment. Additional analysis to confirm these results was completed by undertaking Chromium Reducible Sulphur (CRS) testing (Table 10).

Table 9: SPOCAS results

15/09/2020	pH _{KCl} (23A)	Sulphidic - TAA (s-23F)	pH _{ox} (23B)	Sulphidic - TPA (s-23G)	Sulphidic - TSA (s-23H)	Peroxide Oxidisable Sulphur (23Ee)	Net Acidity excluding ANC	Net Acidity excluding ANC	Liming Rate excluding ANC	Net Acidity	Net Acidity	Liming Rate
	pH Units	% Pyrite Sulphur	pH Units	% Pyrite Sulphur	% Pyrite Sulphur	% S	% S	mole H ⁺ /t	kg CaCO ₃ /t	% S	mole H ⁺ /t	kg CaCO ₃ /t
LOR	0.1	0.005	0.1	0.005	0.005	0.005	0.005	5	1	0.005	5	1
TP02-1.0	5.1	0.022	5	0.022	<0.005	0.005	0.027	17	2	0.027	17	2
TP04-2.0	4.7	0.024	5.2	0.024	<0.005	0.005	0.024	15	2	0.024	15	2
TP05-0.1	4.5	0.064	3.9	0.095	0.03	0.013	0.077	48	7	0.077	48	7
TP07-2.0	4.7	0.035	5.6	0.035	<0.005	0.006	0.041	26	4	0.041	26	4
TP08-2.0	5.8	0.014	6.3	0.014	<0.005	<0.005	0.014	9	1	0.014	9	1
TP09-0.1	5.2	0.026	5.3	0.026	<0.005	0.032	0.058	36	5	0.058	36	5

Table 10: CRS results

15/09/2020	pH _{KCl} (23A)	Sulphidic - TAA (s-23F)	Chromium Reducible Sulphur (22B)	Net Acidity	Net Acidity	Liming Rate	Net Acidity excluding ANC	Net Acidity excluding ANC	Liming Rate excluding ANC
	pH Units	% Pyrite Sulphur	% S	% S	mole H ⁺ /t	kg CaCO ₃ /t	% S	mole H ⁺ /t	kg CaCO ₃ /t
	0.1	0.005	0.01	0.01	10	1	0.01	10	1
TP02-0.1	6.7	<0.005	<0.01	<0.01	<10	<1	<0.01	<10	<1
TP05-0.1	4.5	0.064	<0.01	0.06	40	5	0.06	40	5
TP07-2.0	4.7	0.035	<0.01	0.04	30	3	0.04	30	3

11.5 Western Paddock – Contaminated Waste Fill

Whilst no additional investigation were undertaken with respect to the soil quality within the large stockpile of contaminated waste fill, known as Western Paddock, results from previous investigations have been summarised as follows (Table 11):

Table 11: Western Paddock, Summary Soil Quality & Waste Characterisation (Aurora 2015).

	Metals											Leachable Metals							Total Petroleum Hydrocarbons						
	Arsenic	Barium	Cadmium	Chromium	Copper	Mercury	Manganese	Molybdenum	Nickel	Lead	Zinc	pH	Arsenic	Cadmium	Chromium	Molybdenum	Nickel	Lead	Mercury	C ₁₀	C ₁₅₋₂₀	C ₁₅₋₂₀	C ₂₅₋₃₀	Total TPH	Asbestos
CRITERIA	500	50000	100	500(h)	50000	75	50000	1000	3000	1500	50000	NV	NV	NV	NV	NV	NV	NV	NV	2800	NV	NV	NV	NV	NV
ASLP	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	0.5	0.1	0.5	0.5	0.2	0.5	0.01	NV	NV	NV	NV	NV	NV
EIL	20	400	3	50(1)	80	1	500	40	60	300	200	NV	NV	NV	NV	NV	NV	NV	NV	100	500	1000	NV	NV	NV
HIL A	100	5370	20	210(m)	1000	15	1500	390	600	300	7000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
STATISTICAL ANALYSIS																									
max	62	480	7.5	130	5200	8.8	1100	10	260	3400	2200	8.45	<0.05	<0.001	0.007	0.006	0.016	0.05	0.0001	<10	<10	<10	<20	<20	0
mean	12.7442	122.567	2.54074	37.2037	621.722	0.58526	217.056	3.28571	30.1852	618.278	325.611	7.79907	<0.05	<0.001	0.00245	0.00482	0.009	0.02538	0.0001	<10	<10	<10	<20	<20	0
std dev	15.0785	92.6053	1.94524	25.715	1.30035	218.32	3.45033	38.0545	804.309	419.488	0.42242	<0.05	<0.001	0.0016	0.00198	0.00698	0.01506	1.45-20	0	0	0	0	0	0	0
mean+std dev	28.4226	215.272	4.09498	62.9187	1765.23	1.58551	435.975	6.73604	68.8395	1422.58	745.1	8.2215	<0.05	<0.001	0.00405	0.0068	0.01506	0.04045	0.0001	0	0	0	0	0	0
QUALITY CONTROL ANALYSIS																									
SPUT 5	7	110	5.2	75	110	0.36	300	1	33	300	300	7.7	<0.05	<0.001	0.002	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
Dup 1	13	130	3.5	58	150	0.47	500	1	40	340	340	8.2	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
RPD (%)	0.3	0.08333	0.06977	0.06351	0.13333	0.06527	0.125	0	0.04795	0.03125	0.03125	0.01572	0	0	0	0	0	0	0	0	0	0	0	0	0
SPUT 28	21	270	7.5	130	5200	0.31	650	5	120	7200	1100	8	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
Dup 2	18	330	3.6	20	800	0.82	460	1	135	1600	1200	7.3	<0.05	<0.001	0.001	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
RPD (%)	0.07892	0.08476	0.36364	0.3	0.70772	0.45133	0.14035	0.21429	0.04	0.14286	0.04348	0.04575	0	0	0	0	0	0	0	0	0	0	0	0	0
SPUT 40	11	170	2.4	42	510	0.17	230	<1	35	730	450	8.35	<0.05	<0.001	<0.001	<0.005	<0.005	<0.1	0.0001	0	0	0	0	0	0
Dup 3	18	110	2.1	25	1000	0.12	210	<1	34	570	260	7.75	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
RPD (%)	0.24138	0.21429	0.06667	0.1851	0.3245	0.17241	0.04545	0	0.05556	0.12308	0.26761	0.03727	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:																									
500	Value exceeds Class 1 Landfill Waste Classification Criteria (DoE 2005)											NAD denotes No Asbestos Detected							NV denotes No Value Specified						
NV	Value exceeds Class 1 (leachable Concentration) Landfill Waste Classification Criteria (DoE 2005)											Chrys denotes Chrysotile Asbestos Detected							-/- denotes Not Analyzed						
20	Value exceeds Ecological Investigation Level (DoE 2003)											Amos denotes Amosite Asbestos Detected													
100	Value exceeds Health Investigation Level 'H' - Standard Residential Setting Landuse Scenario (DoE 2003)																								

All laboratory documentation is presented in Appendix 5.

12. Updated conceptual site model

Upon completion of the DSI and remedial the CSM was revisited. No additional source-pathway-receptor linkages were identified and no significant human health or environmental risks are present. To manage any uncertainty, it is recommended that protocols for unexpected finds are clearly defined in the CEMP.

13. Ongoing Site Management

The most likely risk is the potential for encountering ACM and asbestos fibres within the contaminated waste fill stockpiled within the Western Paddock. There is also a low potential for unexpected finds during construction. Therefore, as part of the proposed CEMP, the following management measures are recommended for works undertaken within the Western Paddock and any unexpected finds of contamination outside the Western Paddock that may occur during construction:

- ensuring that all workers are aware of the potential of encountering unexpected contamination
- have personal protective equipment (PPE) available (P2 masks and disposable coveralls)
- establish stop work protocols in the unlikely event that asbestos fines of fibrous asbestos are identified
- develop a Health and Safety Plan (HSP)
- develop a Waste Management Plan (WMP).

The HSP shall discuss and document:

- the potential for exposure (risk profile)
- the equipment and procedures to be adopted to mitigate exposure
- the minimum requirements of appropriate personal protective equipment (PPE)
- requirement for dust control measures (if any).

The WMP shall discuss and document:

- the nature and extent of contaminants in the generated waste material (i.e. waste classification). This should refer to the existing contamination within the Western Paddock as described in
- the plant, equipment and procedures to be adopted to excavate, stockpile, transport and dispose of waste material
- the minimum requirements of appropriate personal protective equipment (PPE) for personnel undertaking excavation, stockpiling, transportation and disposal of waste material
- adequate dust control measures (if any)
- protocols for tracking and recording any waste that is transported and disposed offsite.

13.1 Hazard controls

In the unlikely event of unexpected finds, particularly ACM, the following hazard controls are recommended.

13.1.1 Contaminated Work Areas

The area within the Western Paddock should be clearly demarcated and treated as no-entry area unless the applicable PPE is worn. If other unexpected finds of ACM occur these should also be clearly demarcated with temporary fencing, bunting or the like and treated in the same manner. The work area should include sufficient space for all equipment and handling of fill materials (including stockpiles). The work area should be demarked for the duration of activities, including for stockpiling of any wastes.

13.1.2 Personal Protective Equipment requirement

In addition to personal protective equipment (PPE) which may be required to control other hazards, the minimum PPE requirements for people undertaking removal of ACM includes disposable coveralls, disposable gloves and a half face (class P2) disposable or particulate filter (cartridge) respirator.

All disposable PPE should be removed and placed in a suitable container (dedicated rubbish bin with heavy duty plastic bag liner – marked asbestos) before leaving the contaminated zone. The plastic bags should not be over filled and should be sealed (goose necked) with duct tape and disposed as asbestos waste to an applicable licenced facility.

The contractor should ensure sufficient supplies of the required PPE.

13.1.3 Management of Unexpected Asbestos Containing Material

All visible ACM debris should be removed from the area such that any risk of asbestos fibre inhalation has been effectively eliminated. ACM should be removed by licenced asbestos removalists in accordance with protocols developed by the removalists to meet regulatory standards. ACM must be disposed to an approved landfill in accordance with the Landfill Waste Classification and Waste Definitions 1996 (As amended) (December 2019). The contractor can remove soils impacted by asbestos by placing it into HDPE lined skip bins, which are sealed prior to transport.

13.1.4 Dust and asbestos air quality management

Dust control measures are likely to be required for the removal and management of existing contaminated soils within the Western Paddock. The dust and asbestos air quality monitoring plan should be prepared by qualified environmental consultant or occupational hygienist.

13.1.5 Waste management

Any ACM (including disposable PPE) or asbestos-impacted soil from the Western Paddock may need to be disposed of at an appropriately licensed Special Waste Type 1 landfill as per DWER *"Landfill Waste Classifications and Waste Definitions 1996 (as amended 2019)"*. Sufficient data is presented in Aurora 2015 (Appendix 6) and summarised in Table 11 to characterise the landfill class as Class I – Special Waste Type 1. The reuse of the material as road base may be acceptable with proper protocols, including a warning barrier and the placement of an adequate depth of clean material (0.5m has been used elsewhere under carparks in Midland) above the contaminated material. Approval should be sought from the DWER prior to placing known contaminated material within the proposed road reserve, which has been found to be un-contaminated.

13.2 Contingency measures

In the unlikely event unexpected asbestos materials or other contaminants are uncovered outside the known area of contaminated waste fill within the Western Paddock, the area should be cordoned off and management/remediation undertaken in accordance with the health and safety protocols listed above.

14. Conclusions and recommendations

Based on the field and analytical data acquired during this investigation the following conclusions and recommendations are provided.

14.1 Conclusions

Soil quality was investigated across the proposed road alignment for the potential contaminants of concern associated with contaminated waste fill from the former Midland Railway Workshops. The results indicated the soils were free from significant contamination and no further investigation is required.

The alignment will require the removal of existing contaminated material within the Western Paddock stockpile. Stockpiled material within the Western Paddock will require management if moved or used as controlled fill along the proposed road alignment.

The risk to human health and the environment is considered low, providing adequate management protocols are adhered to as outline in Section 14.

14.2 DQO decision statement conclusions

The following summary is presented in the context of the decisions statements outlined in the project DQOs.

What complete source-pathway-receptor linkages exist in the CSM when incorporating the additional data obtained through the DSI?

At the time of writing this report, complete source-pathway-receptor linkages were identified for human exposure to soil contaminants within the Western Paddock. These risks are considered manageable through the implementation of standard remediation management protocols (Section 14).

In the alignment outside the Western Paddock, no complete source-pathway-receptor linkages were identified and contaminant concentrations were found to comply with adopted assessment guidelines.

Are additional investigations required to address the DSI objectives, or to determine the need for remediation and/or management to allow for the proposed development?

No further environmental investigation are required and the construction can proceed as long as the recommended management protocols are implemented.

Are there any off-site migration issues that need to be considered further?

Dust and asbestos air quality monitoring should be considered during works within the existing Western Paddock. If unexpected finds are identified along the proposed road alignment further management will be needed.

Is the data sufficient to enable the preparation of an auditor report to allow the re-classification of the site?

An auditor report is not required; however, the City may wish to engage one to review this report.

14.3 Recommendations

Based on the above findings and conclusions, assuming adherence to the recommended management protocols the items following are recommended:

- Confirm DWER approval for the use of the residual contaminated waste fill in a controlled manner along the alignment.
- A Construction and Environmental Management Plan (CEMP) should be prepared that includes unexpected finds protocols, dust and asbestos air quality monitoring plan, an Asbestos Management plan and a Waste Management plan. This CEMP should be implemented during all works within the proposed road alignment.

15. Limitations

It should be advised that whilst all effort has been undertaken to identify soil contaminants, it is not possible to eliminate all potential risks to persons involved in future site works, although they are considered very low.

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results, conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

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Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, Strategen-JBS&G reserves the right to review the report in the context of the additional information.

16. References

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- National Environmental Protection Council (NEPC) 2013a, *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1) - Schedule B2 Guideline on Site Characterisation*, [Online], Available from: <<http://www.comlaw.gov.au/Details/F2013C00288/Download>>.
- National Environmental Protection Council (NEPC) 2013c, *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1) - Schedule B3 –*

- Guideline on Laboratory Analysis of Potentially Contaminated Soil [Online], Available from: <<http://www.comlaw.gov.au/Details/F2013C00288/Download>>.
- Standards Australia (SA) 1998, AS/NZS 5667.1:1998 Water Quality – Sampling. Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples.
- Standards Australia (SA) 2005: AS 4482.1. Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil Part 1 Non-volatile and Semi-volatile Compounds.
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- Strategen (2017b), Helena East Precinct, Former Midland Railway Workshops, Annual Groundwater Monitoring Report and Assessment of Natural Attenuation. Prepared for the Metropolitan Redevelopment Authority

Appendix 1: DWER Basic Summary of Records



Contaminated Sites Act 2003 Basic Summary of Records Search Response

Report generated at 12:28:03PM, 07/12/2020

Receipt No:

ID No: 73147

Search Results

This response relates to a search request received for:

Road Reserve

Midland, WA, 6056

Road reserve (Landgate PIN: 12295720), Midland WA 6056

This parcel belongs to a site that contains 13 parcel(s).

According to Department of Water and Environmental Regulation records, this land has been reported as a known or suspected contaminated site.

Address	Road Reserve Midland, WA, 6056 Road reserve (Landgate PIN: 12295720), Midland WA 6056
Lot on Plan Address	Road Reserve
Parcel Status	<p>Classification: 05/03/2020 - <i>Remediated for restricted use</i></p> <p>Nature and Extent of Contamination:</p> <p>Following remediation, residual waste fill material and contaminated soil remains beneath the site.</p> <p>Restrictions on Use:</p> <p>The land use of the site is restricted to the current (i.e. road reserve) land use with minimum soil access, which excludes sensitive uses with accessible soil such as childcare centres, kindergartens, pre-schools and primary schools. The site should not be developed for a more sensitive use such as recreational open space, residential use or childcare centres without further contamination assessment and/or remediation.</p> <p>Other than for analytical testing or remediation, groundwater abstraction is not permitted at this site.</p> <p>Reason for Classification:</p> <p>This site was reported to the Department of Water and Environmental Regulation (the department) prior to the commencement of the 'Contaminated Sites Act 2003' (the Act). The site has been classified under section 13 of the Act based on information submitted to the department by January 2020.</p> <p>The site historically formed part of the former Midland Railway Workshops which were operated for approximately 90 years, from 1904 to 1994. Railyards and motor vehicle workshops are land uses which have the potential to cause contamination, as specified in the guideline 'Assessment and management of contaminated sites' (Department of Environment Regulation [DER], 2014).</p> <p>During operation of the Midland Railway Workshops, the site was used for construction and maintenance of locomotives and rolling stock. Historical work practices and use of waste as fill material resulted in soil, sediment and groundwater contamination. Following closure, the site was subject to a large number of stages of contamination investigation and remediation to enable re-</p>

Disclaimer

This Summary of Records has been prepared by Department of Water and Environmental Regulation (DWER) as a requirement of the Contaminated Sites Act 2003. DWER makes every effort to ensure the accuracy, currency and reliability of this information at the time it was prepared, however advises that due to the ability of contamination to potentially change in nature and extent over time, circumstances may have changed since the information was originally provided. Users must exercise their own skill and care when interpreting the information contained within this Summary of Records and, where applicable, obtain independent professional advice appropriate to their circumstances. In no event will DWER, its agents or employees be held responsible for any loss or damage arising from any use of or reliance on this information. Additionally, the Summary of Records must not be reproduced or supplied to third parties except in full and unabridged form.



Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report generated at 12:28:04PM, 07/12/2020

development of the site.

Waste fill material comprised cinder, ash and foundry slag with occasional soil fill and rubble. Metals were present at concentrations exceeding human health and/or ecological assessment levels that were relevant at the time of investigation and remedial works. Fibrous asbestos and asbestos fines, and localised areas of hydrocarbons (such as from diesel or oil), polycyclic aromatic hydrocarbons and chlorinated hydrocarbons (such as from solvents) were also present in waste fill material and contaminated soil.

Metals were present in groundwater at concentrations exceeding human health and/or ecological assessment levels that were relevant at the time of investigation and remedial works. Localised hydrocarbons, polycyclic aromatic hydrocarbons and chlorinated hydrocarbons were also present in groundwater.

Remedial works comprising excavation of waste fill material and contaminated soil were carried out. Excavated contaminated material was disposed off-site or relocated on-site and contained beneath a warning and / or geotextile barrier. Residual contaminated material also remains beneath the site where further excavation was not practicable which, in some areas, may have been covered by a warning barrier. Some areas were not validated, therefore there is the potential for residual contaminated material to be present in soil across the site. Groundwater monitoring carried out after completion of remedial works found that contaminated groundwater remains present beneath the site.

Risk assessment has indicated that provided it is not disturbed, residual contamination at the site does not pose an unacceptable risk to human health, the environment or environmental values under the current land uses of road reserves.

Based on the information provided, provided residual contamination is not disturbed and groundwater is not abstracted, the site is suitable for the current road reserves use, but may not be suitable for more sensitive land uses (e.g. residential housing or child care centres).

The site is contaminated and has been remediated such that it is suitable for current road reserve land use, but may not be suitable for a more sensitive land use. Therefore, the site is classified as 'remediated for restricted use'.

A memorial stating the site's classification has been placed on the certificate of title, and will trigger the need for further investigations and risk assessment should the site be proposed for a more sensitive land use.

The department, in consultation with the Department of Health, has classified this site based on the information available to the department at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to the department, and as such, the usefulness of this information may be limited.

Other Relevant Information:

Additional information included herein is relevant to the contamination status of the site and includes the department's expectations for action that should be taken to address potential or actual contamination described in the Reasons for Classification.

Where the land is part of a transaction - sale, mortgagee or lease agreement, the land owners **MUST PROVIDE WRITTEN DISCLOSURE** (on the prescribed Form 6) of the site's status to any potential

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Contaminated Sites Act 2003

Basic Summary of Records Search Response

Report generated at 12:28:04PM, 07/12/2020

	<p>owner, mortgagee (e.g. financial institutions) or lessee at least 14 days before the completion of the transaction. A copy of the disclosure must also be forwarded to the department.</p> <p>Action Required:</p> <p>Areas of the site are subject to site management plans prepared for the Metropolitan Redevelopment Authority. Prior to excavation or disturbance of soil, sediment or groundwater (e.g. dewatering) at the site, appropriate site management measures to protect human health and the environment should be confirmed or developed (if there is not an existing relevant management plan) for implementation.</p>
Certificate of Title Memorial	<p>Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact Contaminated Sites at the Department of Water and Environmental Regulation.</p>
Current Regulatory Notice Issued	<p>Type of Regulatory Notice: <i>Nil</i></p> <p>Date Issued: <i>Nil</i></p>
General	<p>No other information relating to this parcel.</p>

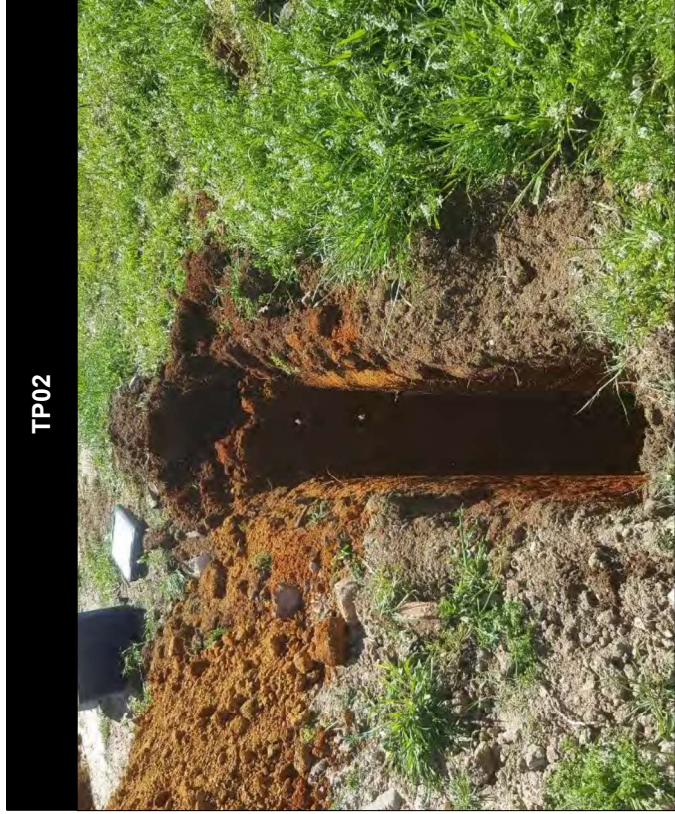
Disclaimer

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Appendix 2: Site photos



TP01



TP02



TP03



TP04



Job No: 59422

Client: City of Swan

Version: R01 Rev A Date: 15/09/2020

Drawn By: PM Checked By: PB

Not to Scale

Coord. Sys n/a

Workshop Avenue DSI

TP05



TP06



TP07



TP08



Job No: 59422

Client: City of Swan

Version: R01 Rev A

Date: 15/09/2020

Drawn By: PM

Checked By: PB

Not to Scale

Coord. Sys n/a

Workshops Avenue DSI

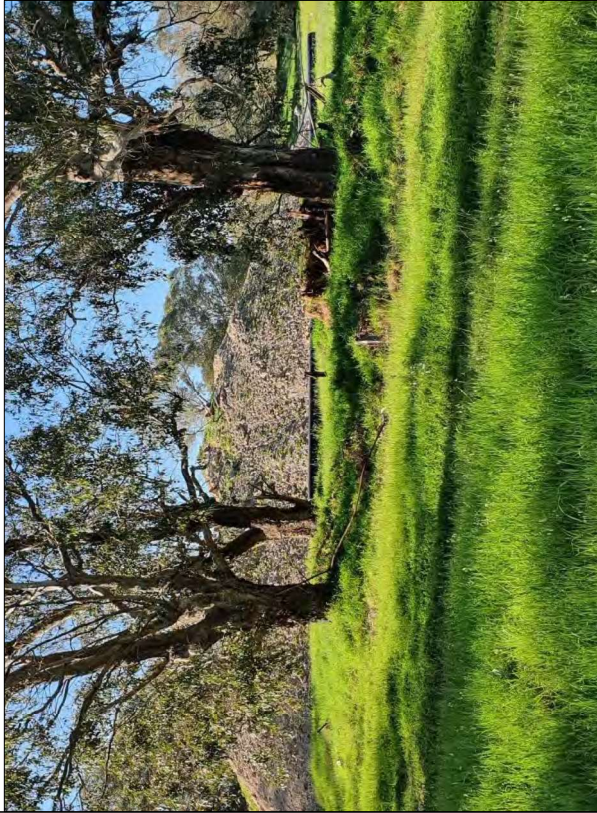
TP09



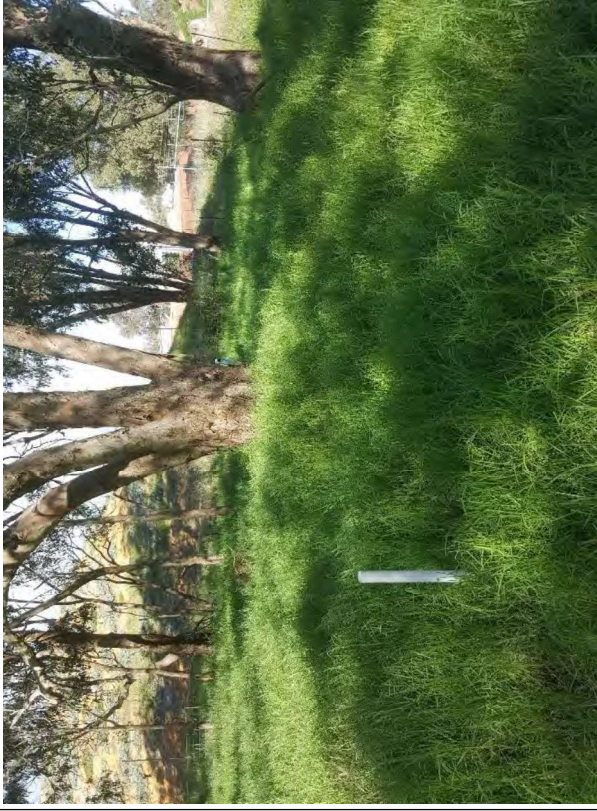
TP10



ASBESTOS IMPACTED SOIL STOCKPILE NEAR TP02



ROAD ALIGNMENT LOOKING TOWARDS WESTERN PADDOCK



Job No: 59422

Client: City of Swan

Version: R01 Rev A

Date: 15/09/2020

Drawn By: PM

Checked By: PB

Not to Scale

Coord. Sys n/a

Workshops Avenue DSI

Appendix 3: Calibration certificates



CHECKLIST FOR

PHOCHECK TIGER PRODUCT RANGE

KIT CONTENTS

PhoCheck Tiger Instrument	<input checked="" type="checkbox"/>	Benzene Pre-Filter Tubes (pack of 10)	
PhoCheck Tiger Select Instrument		Benzene Tube Holder	
Li-ion Battery Pack	<input checked="" type="checkbox"/>	Benzene Tube Opener	
Alkaline Battery Pack			
Instrument Boot	<input checked="" type="checkbox"/>		
Charger	<input checked="" type="checkbox"/>		
Power Supply (12V)	<input checked="" type="checkbox"/>		
Quick Start Guide (Standard)	<input checked="" type="checkbox"/>		
Quick Start Guide (Tiger Select)			
Warranty Registration Card	<input checked="" type="checkbox"/>		
Safety Notice for Tiger Instrument	<input checked="" type="checkbox"/>		
USB Cable	<input checked="" type="checkbox"/>		
Accessory Kit	<input checked="" type="checkbox"/>		

UPGRADES

H&S (STEL & TWA)	861300	<input checked="" type="checkbox"/>
PPB (Sensitivity)	861301	
Data Logging (Full)	861303	<input checked="" type="checkbox"/>
Single Log (Push to log)	861309	
Multi Log	861310	
Tiger Select		

QUALITY CHECK

Software version:	0.8.11
Integrity seal present?	<input checked="" type="radio"/> Yes <input type="radio"/> No

Final instrument inspection date:	19/09/18
-----------------------------------	----------

PD-FM-075-10

Unrivalled Gas Detection.

ION Science Ltd, The Hive, Butts Lane, Fowlmere, Cambs, SG8 7SL, UK

T +44 (0)763 208503 E info@ionscience.com W ionscience.com



CALIBRATION CERTIFICATE

Date of Calibration: - 18th September 2018

Calibrated by: - R.Redrup

Customer: - Airmet

Description: - Tiger

Manufacturer: - ION Science Ltd

Type Number: - N/A

Serial Number: - T-113998

Service Due date: - September 2019

This instrument has been factory calibrated to fully documented procedures in accordance with our ISO 9001:2008 Quality Management System.

Measurement standards are derived from volumetric and time sources which have been calibrated at an accredited laboratory traceable to National or International standards. The following list indicates the serial numbers of equipment used during the calibration procedure.

BAR02	C9559 / A11410 ¹				
-------	-----------------------------	--	--	--	--

¹ Gas mixtures prepared using equipment traceable to N.P.L. standards against Suppliers Certificate No.

The instrument has been calibrated at a temperature of 22.0°C ± 0.25°C and a barometric pressure of 1005.4 mbar ± 2 mbar.

ION Science hereby certify that on the day of calibration the instrument was working according to the manufacturer's original sales specification as checked by the calibration procedure, unless otherwise stated.

Copies of this certificate may only be reproduced in full.

Calibrations are valid as certified only on date of Calibration. For correct instrument operation please see the User Manual.

RESULTS ON DESPATCH

Applied Concentration	Instrument Indication
102.0 ppm Isobutylene	102.3 ppm Isobutylene

The estimated applied gas uncertainty is ± 2.0%

Comments: -

PD-FM-086-07

Unrivalled Gas Detection.

ION Science Ltd, The Hive, Butts Lane, Fowlmere, Cambs, SG8 7SL, UK

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Appendix 4: Soil sampling logs

Daily Field Report

Date 15/9/20 Page of
 Project number 59422 Project manager PB
 Project name Workshops Ave DSI Completed by PM
 Arrival time 8:00am Weather Fine
 Depart time 4:00 pm
 Subcontractor(s) Strataprobe
 Site address Workshops Avenue
 Purpose of visit 10 test pits and soil sampling

Notes

(include sketch or
attach site
map/plan)

- Arrived on site at 8:00am
- Completed review of DBXD and Safety documents.
- Completed site walkover and marked out sampling locations.
- Access to entire alignment achievable from Loyd ~~Avenue~~ Street.
- Presence of large stockpiles containing building rubble (including car battery) were observed to Eastern end of alignment.
- Installed testpits and took soil samples. 3 per testpit.
- Fill material was observed at TPO1 and TPO2 towards surface. And full depth of TPO10. No ACM observed. No rubble, staining or odours observed.
- Remaining material appeared to be natural clay/sandy clay.
- Water level observed at approx 2.0mbsl in some testpits.
- Site walkover completed to next location of GW monitoring wells on site - See following page.
- Left site at 4:00pm and took samples to the lab ARL and MRL

Other forms
 completed
 (eg, bore logs,
 PID/XRF
 calibration forms)

Note: This document contains information that is privileged, confidential or otherwise protected from use, disclosure, reproduction or distribution © JBS&G Australia

Daily Field Report

Date _____ Page ____ of ____

Project number _____ Project manager _____

Project name _____ Completed by _____

Arrival time _____ Weather _____

Depart time _____

Subcontractor(s) _____

Site address _____

Purpose of visit

Well locations

Notes
(include sketch or
attach site
map/plan)

Well 1: behind TPO1 (stockpiles) 50 m standpipe
water at approx 4.1 mgl

406356.365, 6470281.845

Well 2: Blue standpipe - 406317.869, 6470356.756

Well 3: 50m PVC casing water at approx 4.00 mgl
406306.101, 6470355.649


Well 4: 50mm PVC, 406267.912, 6470342.965. deeper than 5m
has water.

Well 5: 50mm PVC casing. Deeper than 5m. Has water
approx 3.5m 406224.684, 6470396.061
North of Access way after creek

Well 6: Blue standpipe 406158.899, 6470442.405
Deeper than 5m. Has water


Other forms
completed
(eg, bore logs,
PID/XRF
calibration forms)

Note: This document contains information that is privileged, confidential or otherwise protected from use, disclosure, reproduction or distribution © JBS&G Australia


	Test Pit: TP01	Project No: 59422
	Borehole:	Client: CoS
	Well:	Project Name: Workshops Ave DS1
		Site Address: Workshops Ave, Midland

Date: 15/9/20	Easting (MGA94): 466372.258	Water Level Initial (mbgs): NA	Date:	Time:
Logged By: PM	Northing (MGA94): 6470288.48	Water Level Static (mbgs):	Date:	Time:
Contractor: Strataprobe	Zone/Area: M 40A50	Surface Finish: to topsoil - fill		
Total Hole Depth (mbgs): 2m	Reference Level: GL	Casing Type:	Depth To (m bgs):	
Bore Diameter (mm) / Pit Dimension (m): 1x0.5x2	Elevation (m):	Screen Type:	Depth To (m bgs):	
Method: ex	Depth To (m bgs): 2.0m	Comment:	Depth To (m bgs):	
Method:	Depth To (m bgs):	Comment:	Depth To (m bgs):	
Method:	Depth To (m bgs):	Comment:	Depth To (m bgs):	


SUBSURFACE PROFILE				SAMPLE			WELL	
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description	Sample ID	PID (ppm)	Sample Type	Comments	Construction
			Surface Description: Silty Sand Top Soil					
0-0.3	F	SM	Silty SAND, poorly graded, f-m, medium density, grey/brown, orange mottled, wet, dry, contains some f-c, fine rounded gravels, some clay content	SB01-0.1	0			no odour, skinning ACUT observed,
0.3-0.4	F	SW	SAND, well graded, f-m, loose, homo, brown, light tan, dry, contains roots	SB01-0.3				
0.4-0.5	F		Silty SAND, poorly graded, f-m, m. dense, grey/brown, homo, clumping, dry, inclusions little f-c gravels	SB01-0.4				
0.5-1.0	N	SC	clayey SAND, w. graded, f-m, dense and clumping, orange/brown, homo, dry, contains little f-m, angular-rounded gravels.	SB01-1.0	0			
1.0-2.0	N	SC	clayey SAND, w. graded, f-m, m. dense, clumping, orange, homo, dry, contains little f-m, angular-rounded gravels.	SB01-2.0	0			

Method	Sample Type	Reference Level	Screen/Casing Type	Backfill Type	Well Finish	Pit Dimensions (m)	Well Development Details
HA - Hand Auger NDD - Non Destructive Drilling SFA - Solid Flight Auger HFA - Hollow Flight Auger PT - Push Tube AH - Air Hammer TP - Test Pit	D - Disturbed U - Undisturbed	AHD - Australian Height Datum TOC - Top of Casing GS - Ground Surface	Class 18 PVC (50mm) - PVC50	BK - Backfill BN - Bentonite 2SP - 2mm Graded Sand	RB - Roadbox MT - Monument SP - Standpipe	A: B: C: 	

Lithologic Classification - All Soils				Coarse Grained Soils				Fine Grained Soils				All Soils				Surface	Rocks
Lithologic Type	Lithologic Class - Soil	Texture	Grading	Grain Size	Angularity	Density	Plasticity	Consistency	Colour	Structure	Moisture	Inclusions	Contamination	Surface Materials	Lithologic Class - Rocks		
FILL (FL) NATURAL (NT)	GRAVEL (GW) GRAVEL (GP) Silty GRAVEL (GM) Clayey GRAVEL (GC) SAND (SW) SAND (SP) Silty SAND (SM) Clayey SAND (SC) SILT (ML) CLAY (CL) Organic SILT (OL) SILT (MH) CLAY (CH) Organic CLAY (OH) PEAT (Pt)	gravely sandy silty clayey organic	poorly graded well graded	boulders cobbles coarse gravel medium gravel fine gravel coarse sand medium sand fine sand	very angular angular sub-angular sub-rounded rounded well rounded	very loose loose medium dense dense very dense	non-plastic low plasticity medium plasticity high plasticity	very soft soft firm stiff very stiff hard	white black grey red brown orange yellow green blue	homogeneous heterogeneous stratified laminated lens root holes occasional inter-bedded mottled	dry damp moist wet saturated	and (35-50%) some (20-35%) little (10-20%) trace (0-10%)	odour staining solid waste	CONCRETE (CC) BITUMINOUS CONCRETE (BC) TOPSOIL (TS)	LIMESTONE (LS) SANDSTONE (SS) MUDSTONE (MS) SHALE (SH) CONGLOMERATE (CG) PHYLLITE (Ph) TUFF (TF) GRANITE (GR) DOLERITE (DL) BASALT (BS) COAL (CO) COLLUVIUM (CV)		
															Surface Description bare ground grass lightly vegetated heavily vegetated paved sealed		

		Test Pit: TP02		Project No: 59472	
		Borehole:		Client: GS	
Well:		Project Name: Workshops Ave, DSI		Site Address: Workshops Avenue, Midland	
Date: 15/9/20		Easting (MGA94): 406333.234		Water Level Initial (mbgs): NA Date: Time:	
Logged By: PM		Northing (MGA94): 8470309.721		Water Level Static (mbgs): Date: Time:	
Contractor: Strataprobe		Zone/Area: 40A94 TO		Surface Finish:	
Total Hole Depth (mbgs): 2.0		Reference Level: GL		Casing Type: Depth To (m bgs):	
Bore Diameter (mm) / Pit Dimension (m ²): 120.5 x 2		Elevation (m):		Screen Type: Depth To (m bgs):	
Method: EX Depth To (m bgs):		Comment:		Backfill Type: Depth To (m bgs):	
Method: Depth To (m bgs):		Comment:		Backfill Type: Depth To (m bgs):	
Method: Depth To (m bgs):		Comment:		Backfill Type: Depth To (m bgs):	

SUBSURFACE PROFILE				SAMPLE			WELL	
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description	Sample ID	PID (ppm)	Sample Type	Comments	Construction
			Surface Description: Top Soil					
0.0 - 0.1	F	SM	Silty SAND, well graded, f-m, loose, brown, homo, dry, contains little f-m grains, some organic matter and roots.	SB02 - 0.1 Q01 + Q02	0		unit 1	no odours, staining or Acids
0.1 - 1.0	N	C	Sandy CLAY, med - low plasticity, firm, red, homo, dry, contains little f-m gravels.	SB02 - 1.0	0		unit 2	
1.0 - 2.0	W	C	Sandy CLAY, med - low plasticity, orange, dry, contains little f-m, some rounded - sub angular gravels.	SB02 - 2.0	0		unit 3	

Method	Sample Type	Reference Level	Screen/Casing Type	Backfill Type	Well Finish	PIT Dimensions (m)	Well Development Details
HA - Hand Auger NDD - Non Destructive Drilling SFA - Solid Flight Auger HFA - Hollow Flight Auger PT - Push Tube AH - Air Hammer TP - Test Pit	D - Disturbed U - Undisturbed	AHD - Australian Height Datum TOC - Top of Casing GS - Ground Surface	Class 18 PVC (50mm) - PVC50	BK - Backfill BN - Bentonite 2SP - 2mm Graded Sand	RB - Roadbox MT - Monument SP - Standpipe	A: B: C: 	


Lithologic Classification - All Soils			Coarse Grained Soils			Fine Grained Soils			All Soils			Surface		Rocks	
Lithologic Type	Lithologic Class - Soil	Texture	Grading	Grain Size	Angularity	Density	Plasticity	Consistency	Colour	Structure	Moisture	Inclusions	Contamination	Surface Materials	Lithologic Class - Rocks
FILL (FL) NATURAL (NT)	GRAVEL (GW) GRAVEL (GP) Silty GRAVEL (GM) Clayey GRAVEL (GC) SAND (SW) SAND (SP) Silty SAND (SM) Clayey SAND (SC) SILT (ML) CLAY (CL) Organic SILT (OL) SILT (MH) CLAY (CH) Organic CLAY (OH) PEAT (PT)	gravely sandy silty clayey organic	poorly graded well graded	boulders cobbles coarse gravel medium gravel fine gravel coarse sand medium sand fine sand	very angular angular sub-angular sub-rounded rounded well rounded	very loose loose medium dense dense very dense	non-plastic low plasticity medium plasticity high plasticity	very soft soft firm stiff very stiff hard	white black grey red brown orange yellow green blue	homogeneous heterogeneous stratified laminated lens root holes occasional inter-bedded mottled	dry damp moist wet saturated	and (35-50%) some (20-35%) little (10-20%) trace (0-10%)	odour staining solid waste	CONCRETE (CC) BITUMINOUS CONCRETE (BC) TOPSOIL (TS)	LIMESTONE (LS) SANDSTONE (SS) MUDSTONE (MS) SHALE (SH) CONGLOMERATE (CG) PHYLLITE (PH) TUFF (TF) GRANITE (GR) DOLERITE (DL) BASALT (BS) COAL (CO) COLLUVIUM (CV)
														Surface Description	
														bare ground grass lightly vegetated heavily vegetated paved sealed	

		Test Pit: TP03		Project No: 59422	
		Borehole:		Client: LS	
		Well:		Project Name: Workshops Ave DS1	
				Site Address: Workshops Ave, Midland.	
Date: 15/9/20		Easting (MGA94): 406302.72		Water Level Initial (mbgs): NA	
Logged By: PM		Northing (MGA94): 6470323.49		Date: Time:	
Contractor: stratapro		Zone/Area: AD14 SD		Water Level Static (m bgs): Date: Time:	
Total Hole Depth (mbgs): 2.0m		Reference Level: CL		Surface Finish:	
Bore Diameter (mm) / Pit Dimension (m): 100.52		Elevation (m):		Casing Type: Depth To (m bgs):	
Method: PXL Depth To (m bgs): 2.0m		Comment:		Screen Type: Depth To (m bgs):	
Method: Depth To (m bgs):		Comment:		Backfill Type: Depth To (m bgs):	
Method: Depth To (m bgs):		Comment:		Backfill Type: Depth To (m bgs):	


SUBSURFACE PROFILE				SAMPLE			WELL	
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description	Sample ID	PID (ppm)	Sample Type	Comments	Construction
			Surface Description:					
0-0.1			unit 1 red/brown	SB03-0.1	0		no AEM, odour or staining observed.	
0.1-1.0			unit 2	SB03-1.0	0			
1.0-2.0			unit 3	SB03-2.0	0			

Method HA - Hand Auger NDD - Non Destructive Drilling SFA - Solid Flight Auger HFA - Hollow Flight Auger PT - Push Tube AH - Air Hammer TP - Test Pit	Sample Type D - Disturbed U - Undisturbed	Reference Level AHD - Australian Height Datum TOC - Top of Casing GS - Ground Surface	Screen/Casing Type Class 18 PVC (50mm) - PVC50	Backfill Type BK - Backfill BN - Bentonite 2SP - 2mm Graded Sand	Well Finish RB - Roadbox MT - Monument SP - Standpipe	Pit Dimensions (m) A: B: C: 	Well Development Details
--	---	--	---	---	--	--	--------------------------


Lithologic Classification - All Soils				Coarse Grained Soils				Fine Grained Soils		All Soils		Surface		Rocks	
Lithologic Type	Lithologic Class - Soil	Texture	Grading	Grain Size	Angularity	Density	Plasticity	Consistency	Colour	Structure	Moisture	Inclusions	Contamination	Surface Materials	Lithologic Class - Rocks
FILL (FL) NATURAL (NT)	GRAVEL (GW) GRAVEL (GP) Silty GRAVEL (GM) Clayey GRAVEL (GC) SAND (SW) SAND (SP) Silty SAND (SM) Clayey SAND (SC) SILT (ML) CLAY (CL) Organic SILT (OL) SILT (MH) CLAY (CH) Organic CLAY (OH) PEAT (Pt)	gravely sandy silty clayey organic	poorly graded well graded	boulders cobbles coarse gravel medium gravel fine gravel coarse sand medium sand fine sand	very angular angular sub-angular sub-rounded rounded well rounded	very loose loose medium dense dense very dense	non-plastic low plasticity medium plasticity high plasticity	very soft soft firm stiff very stiff hard	white black grey red brown orange yellow green blue	homogeneous heterogeneous stratified laminated lens root holes occasional inter-bedded mottled	dry damp moist wet saturated	and (35-50%) some (20-35%) little (10-20%) trace (0-10%)	odour staining solid waste	CONCRETE (CC) BITUMINOUS CONCRETE (BC) TOPSOIL (TS)	LIMESTONE (LS) SANDSTONE (SS) MUDSTONE (MS) SHALE (SH) CONGLOMERATE (CG) PHYLLITE (PH) TUFF (TF) GRANITE (GR) DIORITE (DL) BASALT (BS) COAL (CO) COLLUVIUM (CV)
														Surface Description bare ground grass lightly vegetated heavily vegetated paved sealed	

		Test Pit: TP04		Project No: 59672	
		Borehole:		Client: CS	
		Well:		Project Name: Workshops Ave (D81)	
				Site Address: Workshops Avenue, Midland	
Date: 15/9/20		Easting (MGA94): 406770.23		Water Level Initial (m bgs): 2.0m Date: Time:	
Logged By: pm		Northing (MGA94): 10670341.68		Water Level Static (m bgs): Date: Time:	
Contractor: Strata Probe		Zone/Area: 62946 50		Surface Finish:	
Total Hole Depth (m bgs): 2.0m		Reference Level: GL		Casing Type: Depth To (m bgs):	
Bore Diameter (mm) / Pit Dimension (m²): 106.5/1		Elevation (m):		Screen Type: Depth To (m bgs):	
Method: ex Depth To (m bgs): 2.0 Comment:				Backfill Type: Depth To (m bgs):	
Method: Depth To (m bgs): Comment:				Backfill Type: Depth To (m bgs):	
Method: Depth To (m bgs): Comment:				Backfill Type: Depth To (m bgs):	


SUBSURFACE PROFILE				SAMPLE		WELL		
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description	Sample ID	PID (ppm)	Sample Type	Comments	Construction
			Surface Description: Top Soil					
0 -0.2	N	SN	Silty to sandy clay Silty SAND, w-graded, f-m grained, loose, brown, homo, dry, some roots and organic matter	SB04 -0.1	0		unit 4	no Acn, odours or staining observed.
0.2 -0.5	N	C	CLAY, reddish brown, low-med plasticity, firm, homo, dry	SB04 -0.5	0		unit 5	
0.5 -2.0	N	C	CLAY, orange with some, brown and grey mottling, medium plasticity, firm, dry becoming wet at 2mbgl	SB04 -2.0	0		unit 6	

Method	Sample Type	Reference Level	Screen/Casing Type	Backfill Type	Well Finish	Pit Dimensions (m)	Well Development Details
HA - Hand Auger NDD - Non Destructive Drilling SFA - Solid Flight Auger HFA - Hollow Flight Auger PT - Push Tube AH - Air Hammer TP - Test Pit	D - Disturbed U - Undisturbed	AHD - Australian Height Datum TOC - Top of Casing GS - Ground Surface	Class 18 PVC (50mm) - PVC50	BK - Backfill BN - Bentonite 2SP - 2mm Graded Sand	RB - Roadbox MT - Monument SP - Standpipe	A: B: C: 	


Lithologic Classification - All Soils				Coarse Grained Soils				Fine Grained Soils				All Soils				Surface		Rocks	
Lithologic Type	Lithologic Class - Soil	Texture	Grading	Grain Size	Angularity	Density	Plasticity	Consistency	Colour	Structure	Moisture	Inclusions	Contamination	Surface Materials	Lithologic Class - Rocks	Surface Description	Lithologic Class - Rocks		
FILL (FL) NATURAL (NT)	GRAVEL (GW) GRAVEL (GP) Silty GRAVEL (GM) Clayey GRAVEL (GC) SAND (SW) SAND (SP) Silty SAND (SM) Clayey SAND (SC) SILT (ML) CLAY (CL) Organic SILT (OL) SILT (MH) CLAY (CH) Organic CLAY (OH) PEAT (Pt)	gravely sandy silty clayey organic	poorly graded well graded	boulders cobbles coarse gravel medium gravel fine gravel coarse sand medium sand fine sand	very angular sub-angular sub-rounded rounded well rounded	very loose loose medium dense dense very dense	non-plastic low plasticity medium plasticity high plasticity	very soft firm stiff very stiff hard	white black grey red brown orange yellow green blue	homogeneous heterogeneous stratified laminated lens root holes occasional inter-bedded mottled	dry damp moist wet saturated	and (35-50%) some (20-35%) little (10-20%) trace (0-10%)	odour staining solid waste	CONCRETE (CC) BITUMINOUS CONCRETE (BC) TOPSOIL (TS)	LIMESTONE (LS) SANDSTONE (SS) MUDSTONE (MS) SHALE (SH) CONGLOMERATE (CG) PHYLLITE (Ph) TUFF (TF) GRANITE (GR) DOLERITE (DL) BASALT (BS) COAL (CO) COLLUVIUM (CV)	bare ground grass lightly vegetated heavily vegetated paved sealed			

		Test Pit: TP05		Project No: 59472	
		Borehole:		Client: Les	
		Well:		Project Name: Workshops Avenue	
				Site Address: Workshops Ave, Midland	
Date: 15/4/20		Easting (MGA94): 406265.44		Water Level Initial (mbgs): NA Date: Time:	
Logged By: pm		Northing (MGA94): 6470373.488		Water Level Static (mbgs): Date: Time:	
Contractor: Shalapside		Zone/Area: 6094 50		Surface Finish:	
Total Hole Depth (mbgs): 2.0m		Reference Level: LL		Casing Type: Depth To (m bgs):	
Bore Diameter (mm) / Pit Dimension (m³): 21/10		Elevation (m):		Screen Type: Depth To (m bgs):	
Method: ck Depth To (m bgs): 2.0m		Comment:		Backfill Type: Depth To (m bgs):	
Method: Depth To (m bgs):		Comment:		Backfill Type: Depth To (m bgs):	
Method: Depth To (m bgs):		Comment:		Backfill Type: Depth To (m bgs):	


SUBSURFACE PROFILE			SAMPLE			WELL		
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description	Sample ID	PID (ppm)	Sample Type	Comments	Construction
			Surface Description:					
0			Surface Description: Top Soil					
-0.4	N		Sandy CLAY, Unit 4	TP05 -0.1	0		no ACM, staining or odour observed.	
-1.7	N		Unit 5	TP05 -1.0	0			
-2.0	N		Unit 6	TP05 -2.0	0			

Method	Sample Type	Reference Level	Screen/Casing Type	Backfill Type	Well Finish	Pit Dimensions (m)	Well Development Details
HA - Hand Auger NDD - Non Destructive Drilling SFA - Solid Flight Auger HFA - Hollow Flight Auger PT - Push Tube AH - Air Hammer TP - Test Pit	D - Disturbed U - Undisturbed	AHD - Australian Height Datum TOC - Top of Casing GS - Ground Surface	Class 18 PVC (50mm) - PVC50	BK - Backfill BN - Bentonite 2SP - 2mm Graded Sand	RB - Roadbox MT - Monument SP - Standpipe	A: B: C: 	

Lithologic Classification - All Soils			Coarse Grained Soils			Fine Grained Soils			All Soils			Surface		Rocks	
Lithologic Type	Lithologic Class - Soil	Texture	Grading	Grain Size	Angularity	Density	Plasticity	Consistency	Colour	Structure	Moisture	Inclusions	Contamination	Surface Materials	Lithologic Class - Rocks
FILL (FL) NATURAL (NT)	GRAVEL (GW) GRAVEL (GP) Silty GRAVEL (GM) Clayey GRAVEL (GC) SAND (SW) SAND (SP) Silty SAND (SM) Clayey SAND (SC) SILT (ML) CLAY (CL) Organic SILT (OL) SILT (MH) CLAY (CH) Organic CLAY (OH) PEAT (PT)	gravely sandy silty clayey organic	poorly graded well graded	boulders cobbles coarse gravel medium gravel fine gravel coarse sand medium sand fine sand	very angular angular sub-angular sub-rounded rounded well rounded	very loose loose medium dense dense very dense	non-plastic low plasticity medium plasticity high plasticity	very soft soft firm stiff very stiff hard	white black grey red brown orange yellow green blue	homogeneous heterogeneous stratified laminated lens root holes occasional inter-bedded mottled	dry damp moist wet saturated	and (35-50%) some (20-35%) little (10-20%) trace (0-10%)	odour staining solid waste	CONCRETE (CC) BITUMINOUS CONCRETE (BC) TOPSOIL (TS)	LIMESTONE (LS) SANDSTONE (SS) MUDSTONE (MS) SHALE (SH) CONGLOMERATE (CG) PHYLLITE (PH) TUFF (TF) GRANITE (GR) DIORITE (DL) BASALT (BS) COAL (CO) COLLUVIUM (CV)
														Surface Description: bare ground grass lightly vegetated heavily vegetated paved sealed	

		Test Pit: TP06		Project No: 59422	
		Borehole:		Client: 65	
		Well:		Project Name: Workshops Apr DSI	
				Site Address: Workshops Avenue, Midland	
Date: 25/9/20		Easting (MGA94): 406215.74		Water Level Initial (mbgs): 2.0m Date: Time:	
Logged By: PM		Northing (MGA94): 6470373.40		Water Level Static (mbgs): Date: Time:	
Contractor: Strataprobe		Zone/Area: 4044.20		Surface Finish:	
Total Hole Depth (mbgs): 2.0		Reference Level: GL		Casing Type: Depth To (mbgs):	
Bore Diameter (mm) / Pit Dimension (m²): 100.5x		Elevation (m):		Screen Type: Depth To (mbgs):	
Method: PK Depth To (mbgs): 2.0		Comment:		Backfill Type: Depth To (mbgs):	
Method: Depth To (mbgs):		Comment:		Backfill Type: Depth To (mbgs):	
Method: Depth To (mbgs):		Comment:		Backfill Type: Depth To (mbgs):	

SUBSURFACE PROFILE				SAMPLE			WELL	
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description	Sample ID	PID (ppm)	Sample Type	Comments	Construction
			Surface Description:					
0.0 -0.1	N		unit 4	TP06 -0.1	0		No Acn, staining or odour observed.	
0.1 -0.6			unit 5	TP06 -0.6	0			
0.6 -2.0			unit 6 contains black mottled material. water at 2.0mbgs/	TP06 -2.0	0			

Method	Sample Type	Reference Level	Screen/Casing Type	Backfill Type	Well Finish	Pit Dimensions (m)	Well Development Details
HA - Hand Auger NDD - Non Destructive Drilling SFA - Suck Flight Auger HFA - Hollow Flight Auger PT - Push Tube AH - Air Hammer TP - Test Pit	D - Disturbed U - Undisturbed	AHD - Australian Height Datum TOC - Top of Casing GS - Ground Surface	Class 18 PVC (50mm) - PVC50	BK - Backfill BN - Bentonite 2SP - 2mm Graded Sand	RB - Roadbox MT - Monument SP - Standpipe	A: B: C: 	

Lithologic Classification - All Soils				Coarse Grained Soils				Fine Grained Soils				All Soils				Surface		Reefs	
Lithologic Type	Lithologic Class - Soil	Texture	Grading	Grain Size	Angularity	Density	Plasticity	Consistency	Colour	Structure	Moisture	Inclusions	Contamination	Surface Materials	Lithologic Class - Rocks				
FILL (FL) NATURAL (NT)	GRAVEL (GW) GRAVEL (GP) Silty GRAVEL (GM) Clayey GRAVEL (GC) SAND (SW) SAND (SP) Silty SAND (SM) Clayey SAND (SC) SILT (ML) CLAY (CL) Organic SILT (OL) SILT (MH) CLAY (CH) Organic CLAY (OH) PEAT (Pt)	gravely sandy silty clayey organic	poorly graded well graded	boulders cobbles coarse gravel medium gravel fine gravel coarse sand medium sand fine sand	very angular angular sub-angular sub-rounded rounded well rounded	very loose loose medium dense dense very dense	non-plastic low plasticity medium plasticity high plasticity	very soft soft firm stiff very stiff hard	white black grey red brown orange yellow green blue	homogeneous heterogeneous stratified laminated lens root holes occasional inter-bedded mottled	dry damp moist wet saturated	and (35-50%) some (20-35%) little (10-20%) trace (0-10%)	odour staining solid waste	CONCRETE (CC) BITUMINOUS CONCRETE (BC) TOPSOIL (TS)	LIMESTONE (LS) SANDSTONE (SS) MUDSTONE (MS) SHALE (SH) CONGLOMERATE (CG) PHYLLITE (PH) TUFF (TF) GRANITE (GR) DOLERITE (DL) BASALT (BS) COAL (CO) COLLUVIUM (CV)				
														Surface Description bare ground grass lightly vegetated heavily vegetated paved sealed					




Test Pit: TP07
Borehole:
Well:


Project No: 59472
Client: CoS
Project Name: Workshop Avenue DS
Site Address: Workshop Ave

Date: 15/9/20	Easting (MGA94): 466187.481	Water Level Initial (mbgs): NA	Date:	Time:
Logged By: PM	Northing (MGA94): 6670402.639	Water Level Static (mbgs):	Date:	Time:
Contractor: Strataprobe	Zone/Area: AD946 50	Surface Finish:		
Total Hole Depth (mbgs): 2.0m	Reference Level: AL	Casing Type:	Depth To (m bgs):	
Bore Diameter (mm) / Pit Dimension (m³): 140.5/2	Elevation (m):	Screen Type:	Depth To (m bgs):	
Method: TX	Depth To (m bgs): 2.0	Comment:	Depth To (m bgs):	
Method:	Depth To (m bgs):	Comment:	Depth To (m bgs):	
Method:	Depth To (m bgs):	Comment:	Depth To (m bgs):	


SUBSURFACE PROFILE				SAMPLE			WELL	
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description	Sample ID	PID (ppm)	Sample Type	Comments	Construction
			Surface Description: Top Soil					
0 -0.1			Unit 4	TP07 -0.1	0		No ACM, odour or staining observed.	
0.1 -0.3			Unit 5					
0.3 -1.0			Unit 6	TP07 -1.0	0			
1.7 -2.0			CLAY, grey/brown/orange mottled, high plasticity, stiff	TP07 -2.0	0			

Method	Sample Type	Reference Level	Screen/Casing Type	Backfill Type	Well Finish	Pit Dimensions (m)	Well Development Details
HA - Hand Auger NDD - Non Destructive Drilling SFA - Solid Flight Auger HFA - Hollow Flight Auger PT - Push Tube AH - Air Hammer TP - Test Pit	D - Disturbed U - Undisturbed	AHD - Australian Height Datum TOC - Top of Casing GS - Ground Surface	Class 18 PVC (50mm) - PVC50	BK - Backfill BN - Bentonite 2SP - 2mm Graded Sand	RB - Roadbox MT - Monument SP - Standpipe	A: B: C: 	


Lithologic Classification – All Soils				Coarse Grained Soils			Fine Grained Soils		All Soils				Surface	Rocks	
Lithologic Type	Lithologic Class - Soil	Texture	Grading	Grain Size	Angularity	Density	Plasticity	Consistency	Colour	Structure	Moisture	Inclusions	Contamination	Surface Materials	Lithologic Class - Rocks
FILL (FL)	GRAVEL (GW)	gravely	poorly graded	boulders	very angular	very loose	non-plastic	very soft	white	homogeneous	dry	and (35-50%)		CONCRETE (CC)	LIMESTONE (LS)
NATURAL (NT)	GRAVEL (GP)	sandy	well graded	cobbles	angular	loose	low plasticity	soft	black	heterogeneous	damp	some (20-35%)		SANDSTONE (SS)	
	Silty GRAVEL (GM)	silty		coarse gravel	sub-angular	medium dense	medium plasticity	firm	grey	stratified	moist	little (10-20%)	odour	BITUMINOUS	
	Clayey GRAVEL (GC)	clayey		medium gravel	sub-rounded	dense	high plasticity	stiff	red	laminated	wet	trace (0-10%)	staining	CONCRETE (BC)	
	SAND (SW)	silty		fine gravel	rounded	very dense		very stiff	brown	lens	saturated		solid waste	TOPSOIL (TS)	
	SAND (SP)	clayey		coarse sand	well rounded			hard	orange	root holes				SHALE (SH)	
	Silty SAND (SM)	organic		medium sand					yellow	occasional				CONGLOMERATE (CG)	
	Clayey SAND (SC)			fine sand					green	inter-bedded				PHYLLITE (PH)	
	SILT (ML)								blue	mottled				TUFF (TF)	
	CLAY (CL)													GRANITE (GR)	
	Organic SILT (OL)													DOLERITE (DL)	
	SILT (MH)													BASALT (BS)	
	CLAY (CH)													COAL (CO)	
	Organic CLAY (OH)													COLLUVIUM (CV)	

	Test Pit: TP08		Project No: 59422	
	Borehole:		Client: CoS	
	Well:		Project Name: Workshops Ave DSI	
			Site Address: Workshops Ave, Midland	
Date: 15/9/20	Easting (MGA94): 406160.90		Water Level Initial (m bgs): 1/A	Date: _____ Time: _____
Logged By: PM	Northing (MGA94): 670456.39		Water Level Static (m bgs): _____	Date: _____ Time: _____
Contractor: Strataprobe	Zone/Area: 50494 50		Surface Finish: _____	
Total Hole Depth (m bgs): 2.0m	Reference Level: CL		Casing Type: _____	Depth To (m bgs): _____
Bore Diameter (mm) / Pit Dimension (m ²): 100.5/2	Elevation (m): _____		Screen Type: _____	Depth To (m bgs): _____
Method: ex Depth To (m bgs): 2.0m	Comment: _____		Backfill Type: _____	Depth To (m bgs): _____
Method: _____ Depth To (m bgs): _____	Comment: _____		Backfill Type: _____	Depth To (m bgs): _____
Method: _____ Depth To (m bgs): _____	Comment: _____		Backfill Type: _____	Depth To (m bgs): _____


SUBSURFACE PROFILE			SAMPLE			WELL		
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description	Sample ID	PID (ppm)	Sample Type	Comments	Construction
			Surface Description: Top Soil					
0	N		unit 4	TP08-0-1	0	NA	No Acum, staining or odour observed.	
-0.2								
0.2								
0.4								
0.4			unit 5	TP08-0.6	0			
0.6								
0.6			unit 6	TP08-2.0	0			
-2.0								

Method	Sample Type	Reference Level	Screen/Casing Type	Backfill Type	Well Finish	Pit Dimensions (m)	Well Development Details
HA - Hand Auger HDD - Non Destructive Drilling SFA - Solid Flight Auger HFA - Hollow Flight Auger PT - Push Tube AH - Air Hammer TP - Test Pit	D - Disturbed U - Undisturbed	AHD - Australian Height Datum TOC - Top of Casing GS - Ground Surface	Class 18 PVC (50mm) - PVC50	BK - Backfill BN - Bentonite 2SP - 2mm Graded Sand	RB - Roadbox MT - Monument SP - Standpipe	A: B: C: 	


Lithologic Classification - All Soils				Coarse Grained Soils				Fine Grained Soils				All Soils				Surface		Rocks	
Lithologic Type	Lithologic Class - Soil	Texture	Grading	Grain Size	Angularity	Density	Plasticity	Consistency	Colour	Structure	Moisture	Inclusions	Contamination	Surface Materials	Lithologic Class - Rocks	Surface Description	Lithologic Class - Rocks		
FILL (FL) NATURAL (NT)	GRAVEL (GW) GRAVEL (GP) Silty GRAVEL (GM) Clayey GRAVEL (GC) SAND (SW) SAND (SP) Silty SAND (SM) Clayey SAND (SC) SILT (ML) CLAY (CL) Organic SILT (OL) SILT (MH) CLAY (CH) Organic CLAY (OH) PEAT (PT)	gravely sandy silty clayey organic	poorly graded well graded	boulders cobbles coarse gravel medium gravel fine gravel coarse sand medium sand fine sand	very angular angular sub-angular sub-rounded rounded well rounded	very loose loose medium dense dense very dense	non-plastic low plasticity medium plasticity high plasticity	very soft soft firm stiff very stiff hard	white black grey red brown orange yellow green blue	homogeneous heterogeneous stratified laminated lens root holes occasional inter-bedded mottled	dry clay moist wet saturated	and (35-50%) some (20-35%) little (10-20%) trace (0-10%)	odour staining solid waste	CONCRETE (CC) BITUMINOUS CONCRETE (BC) TOPSOIL (TS)	LIMESTONE (LS) SANDSTONE (SS) MUDSTONE (MS) SHALE (SH) CONGLOMERATE (CG) PHYLLITE (PH) TUFF (TF)	bare ground grass lightly vegetated heavily vegetated paved sealed	GRANITE (GR) DOLERITE (DL) BASALT (BS) COAL (CO) COLLUVIUM (CV)		

	Test Pit: TP09	Project No: 59422		
	Borehole:	Client: C&S		
	Well:	Project Name: Workshops Ave DS1		
		Site Address: Workshops Avenue, Midland		
Date: 15/1/20	Easting (MGA94): 406174.805	Water Level Initial (mbgs): NA	Date:	Time:
Logged By: pm	Northing (MGA94): 6670462.456	Water Level Static (m bgs):	Date:	Time:
Contractor: strataprobe	Zone/Area: 4DA 94	Surface Finish:		
Total Hole Depth (mbgs): 2.0m	Reference Level: LL	Casing Type:	Depth To (m bgs):	
Bore Diameter (mm) / Pit Dimension (m²): 1x0.5m	Elevation (m):	Screen Type:	Depth To (m bgs):	
Method: TX	Depth To (m bgs): 2.0	Comment:	Backfill Type:	Depth To (m bgs):
Method: TX	Depth To (m bgs):	Comment:	Backfill Type:	Depth To (m bgs):
Method: TX	Depth To (m bgs):	Comment:	Backfill Type:	Depth To (m bgs):

Method:		Depth To (m bgs):		Comment:		Sample Type:			
SUBSURFACE PROFILE						SAMPLE			WELL
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description	Sample ID	PID (ppm)	Sample Type	Comments	Construction	
			Surface Description:						
0			Unit 4	TP09 - 0.1	0	W	No ACM, staining or odour observed.		
0.2									
0.2 - 0.5			Unit 5						
0.5				TP09 - 1.0	0				
2.0			Unit 6 Black ash like material material present.	TP09 - 2.0	6				

Method	Sample Type	Reference Level	Screen/Casing Type	Backfill Type	Well Finish	Pit Dimensions (m)	Well Development Details
HA - Hand Auger NDD - Non Destructive Drilling SFA - Solid Flight Auger HFA - Hollow Flight Auger PT - Push Tube AH - Air Hammer TP - Test Pit	D - Disturbed U - Undisturbed	AHD - Australian Height Datum TOC - Top of Casing GS - Ground Surface	Class 18 PVC (50mm) - PVC50	BK - Backfill BN - Bentonite 2SP - 2mm Graded Sand	RB - Roadbox MT - Monument SP - Standpipe	A: B: C: 	

Lithologic Classification - All Soils				Coarse Grained Soils				Fine Grained Soils				All Soils				Surface	Rocks
Lithologic Type	Lithologic Class - Soil	Texture	Grading	Grain Size	Angularity	Density	Plasticity	Consistency	Colour	Structure	Moisture	Inclusions	Contamination	Surface Materials	Lithologic Class - Rocks		
FILL (FL) NATURAL (NT)	GRAVEL (GW) GRAVEL (GP) Silty GRAVEL (GM) Clayey GRAVEL (GC) SAND (SW) SAND (SP) Silty SAND (SM) Clayey SAND (SC) SILT (ML) CLAY (CL) Organic SILT (OL) SILT (MH) CLAY (CH) Organic CLAY (OH) PEAT (Pt)	gravely sandy silty clayey organic	poorly graded well graded	boulders cobbles coarse gravel medium gravel fine gravel coarse sand medium sand fine sand	very angular angular sub-angular sub-rounded rounded well rounded	very loose loose medium dense dense very dense	non-plastic low plasticity medium plasticity high plasticity	very soft soft firm stiff very stiff hard	white black grey red brown orange yellow green blue	homogeneous heterogeneous stratified laminated lens root holes occasional inter-bedded mottled	dry damp moist wet saturated	and (35-50%) some (20-35%) little (10-20%) trace (0-10%)	odour staining solid waste	CONCRETE (CC) BITUMINOUS CONCRETE (BC) TOPSOIL (TS)	LIMESTONE (LS) SANDSTONE (SS) MUDSTONE (MS) SHALE (SH) CONGLOMERATE (CG) PHYLLITE (PH) TUFF (TF) GRANITE (GR) DOLERITE (DL) BASALT (BS) COAL (CO) COLLUVIUM (CV)		
														Surface Description			
														bare ground grass lightly vegetated heavily vegetated paved sealed			

	Test Pit: TP10	Project No: 59422		
	Borehole:	Client: CoS		
	Well:	Project Name: Workshops Ave, PSI		
		Site Address: Workshops Avenue, Midland.		
Date: 15/1/20	Easting (MGA94): 406097.343	Water Level Initial (mbgs): NA	Date:	Time:
Logged By: PM	Northing (MGA94): 6470482.429	Water Level Static (mbgs):	Date:	Time:
Contractor: Strataprobe	Zone/Area: WD194 Zone 50	Surface Finish:		
Total Hole Depth (mbgs): maxima 2m	Reference Level: LL	Casing Type:	Depth To (m bgs):	
Bore Diameter (mm) / Pit Dimension (m²): 105x2	Elevation (m):	Screen Type:	Depth To (m bgs):	
Method: ex Depth To (m bgs): 2.0 Comment:		Backfill Type:	Depth To (m bgs):	
Method: Depth To (m bgs): Comment:		Backfill Type:	Depth To (m bgs):	
Method: Depth To (m bgs): Comment:		Backfill Type:	Depth To (m bgs):	

Method:		Depth To (m bgs):		Comment:		Backfill Type:		SUBSURFACE PROFILE		SAMPLE				WELL	
Depth (m)	Lithologic Type	Lithologic Class	Lithologic Description			Sample ID	PID (ppm)	Sample Type	Comments	Construction					
			Surface Description:												
0 2.0	F	G	SAND, fine well sorted, f-m, grained, loose, yellow w/ some grey brown mottling homo, dry			TA0-0.1	0		No Acm odours or staining observed.						
						TP10-1.0	0								
						TP10-2.0	0								

Appendix 5: Laboratory documentation

SAMPLE RECEIPT NOTICE

Job Number: 20-16048

Expected Due Date: 22 September 2020

Customer Information

Attention: Phil Bourgault
Customer: JBS&G Australia Pty Ltd
Address: Level 1, 50 Subiaco Square Road
Subiaco WA 6008
Phone Number: (08) 9380 3100
Fax Number: (08) 9380 4606
Report To: Phil Bourgault
Report email: info@jbsg.com.au

Job Information

Project Reference: 59422 - Workshops Ave DSI
Purchase Order:
ARL Quote Number: JBSG070820

Receival Information

Date/Time Received:	16/09/2020	Delivery Mode:	Courier
Temperature of Samples °C:	17.9	Relinquished by:	
Security Seal:	N/A		

Contact Details

Registered by: Ryan Seaton samples@arlgroup.com.au
For any queries relating to sample condition (i.e. breakages/missing samples), registered analyses or sample labelling.

Laboratory Contact: Douglas Todd dougtodd@arlgroup.com.au
For any queries relating to analytical capability, status of testing or explanation of results.

Registration Comments

Disposal of non-microbiological samples will occur after the following time, from the date of issue of Final Report:

Aqueous Sample (non-micro) – 3 months

Solid Samples (non-micro) – 6 months

Disposal of microbiological samples will occur after the following time, from the date of Testing:

Aqueous Sample (micro) – 2 weeks

Solid Samples (micro) – 2 weeks

JBS&G Australia Pty Ltd

SAMPLE RECEIPT NOTICE

Job No: 20-16048

Expected Due Date: 22 September 2020

ANALYSIS ASSIGNED

The following table outlines the procedures assigned to each sample, as taken from the client-supplied Chain of Custody. Details of the individual tests assigned to each procedure can be requested from the laboratory at any time. If any of the information in this document is incorrect, please contact the laboratory as soon as possible.

Sample Number	Sample Description	TRH (NEPM) in Soil	8 Heavy Metals in Soil	Soil Parameters
20-16048-1	TP01-0.1	✓	✓	✓
20-16048-2	TP01-1.0			
20-16048-3	TP01-2.0	✓	✓	✓
20-16048-4	TP02-0.1	✓	✓	✓
20-16048-5	QC01	✓	✓	✓
20-16048-6	TP02-1.0			
20-16048-7	TP02-2.0	✓	✓	✓
20-16048-8	TP03-0.1	✓	✓	✓
20-16048-9	TP03-1.0	✓	✓	✓
20-16048-10	TP03-2.0			
20-16048-11	TP04-0.1	✓	✓	✓
20-16048-12	TP04-0.5			
20-16048-13	TP04-2.0	✓	✓	✓
20-16048-14	TP05-0.1	✓	✓	✓
20-16048-15	TP05-1.0	✓	✓	✓
20-16048-16	TP05-2.0			
20-16048-17	TP06-0.1	✓	✓	✓
20-16048-18	TP06-0.6			
20-16048-19	TP06-2.0	✓	✓	✓
20-16048-20	TP07-0.1	✓	✓	✓
20-16048-21	TP07-1.0			
20-16048-22	TP07-2.0	✓	✓	✓
20-16048-23	TP08-0.1	✓	✓	✓

ARL GROUP

46-48 Banksia Road, Welshpool, Western Australia 6106
Telephone: 08 6253 4444 Facsimile: 08 6253 4440 www.arlgroup.com.au

JBS&G Australia Pty Ltd

SAMPLE RECEIPT NOTICE

Job No: 20-16048

Expected Due Date: 22 September 2020

Sample Number	Sample Description	TRH (NEPM) in Soil	8 Heavy Metals in Soil	Soil Parameters
20-16048-24	TP08-0.6	✓	✓	✓
20-16048-25	TP08-2.0			
20-16048-26	TP09-0.1	✓	✓	✓
20-16048-27	TP09-1.0			
20-16048-28	TP09-2.0	✓	✓	✓
20-16048-29	TP10-0.1	✓	✓	✓
20-16048-30	TP10-1.0			
20-16048-31	TP10-2.0	✓	✓	✓

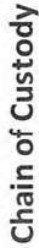


Chain of Custody

PROJECT NO.: 59672		LABORATORY BATCH NO.:				
PROJECT NAME: City Workshops Ave DS1		SAMPLERS:				
DATE NEEDED BY: Standard TAT		QC LEVEL: NEPM (2013)				
PHONE: Sydney 02 8245 0300 Perth 08 9488 0100 Brisbane 07 3211 5350 Melbourne 03 9642 0599 Adelaide 08 8431 7113						
SEND REPORT & INVOICE TO: (1) adminsw@jbsg.com.au; (2) P.O.A.R.g@jbsg.com.au; (3) P.O.A.R.g@jbsg.com.au						
COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:						
please refer to quote JBSG070820						
20-16048						
SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	NOTES
TP01-0.1	S	15/9/20		1x Jar, 1x bag		
TP01-1.0						
TP01-2.0						
TP02-0.1						
QC01						
TP02-1.0						
TP02-2.0						
TP03-0.1						
TP03-1.0						
TP03-2.0						
TP04-0.1						
TP04-0.5						
TP04-2.0						
TP05-0.1						
TP05-1.0						
TP05-2.0						
TP06-0.1						
TP06-0.6						
TP06-2.0						

RELINQUISHED BY:	DATE:	METHOD OF SHIPMENT:	RECEIVED BY:	NAME:	DATE:	OF:	NAME:	DATE:	OF:	FOR RECEIVING LAB USE ONLY:
		CONSIGNMENT NOTE NO.		NAME: 21/09/20	DATE: 15/9/20	OF:	NAME:	DATE:	OF:	COOLER SEAL - Yes..... No..... Intact..... Broken.....
		TRANSPORT CO.								COOLER TEMP deg C 17.9
		CONSIGNMENT NOTE NO.								COOLER SEAL - Yes..... No..... Intact..... Broken.....
		TRANSPORT CO.								COOLER TEMP deg C

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid; Prsld; C = Sodium Hydroxide; Prsld; VC = Hydrochloric Acid; Prsld; Vial; VS = Sulfuric Acid; Prsld; Vial; S = Zinc Prsld; Z = Zinc Prsld; E = EDTA Prsld; ST = Sterile Bottle; O = Other



Chain of Custody

Controlled Copy (June 2015)
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JBSG 070820

Dr Philip Bourgault
Principal
Strategen-JBS&G

7th August 2020

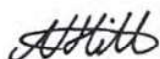
Analysis of Soil Sample

Analyte	Reporting Limit mg/kg	Price/Sample exc. GST	Sample Numbers	Accrued Price exc. GST	Sample Bottle Requirement
TRH/BTEXN plus F1, F2 - NEPM	2, 20, 50, 50, 0.1, 0.1, 0.1, 0.3, 0.5	\$36.00	32	\$1,152.00	1 x 250g Glass Soil Jar
8 Total Metals: As, Cd, Cr, Cu, Ni, Pb, Zn, Hg	5, 0.1, 1, 1, 1, 1, 1, 0.02	\$21.00	32	\$672.00	
Asbestos Identification - Soil	0.1g / kg	\$52.00	32	\$1,664.00	Ziplock - Double Bagged
Total Price (Exc GST)				\$3,488.00	

Analysis of Water Sample

Analyte	Reporting Limit mg/L	Price/Sample exc. GST	Sample Numbers	Accrued Price exc. GST	Sample Bottle Requirement
Total Metals (Fe, Al)	Various Low Levels	\$28.00	5	\$140.00	1 x 125mL Plastic
Dissolved Metals (Al, As, Cr, Cd, Fe, Mn, Na, Ni, Se, Zn)					1 x 125mL Plastic
TRH/BTEXN plus F1 & F2 - NEPM	0.02, 0.05, 0.1, 0.1, 0.001, 0.001, 0.001, 0.003, 0.005	\$38.00	5	\$190.00	1 x 500mL Amber Glass, 2 x 40mL Vials
Full Nutrient Suite (includes Ammonia-N, Nitrate-N, Nitrite-N, NOx-N, TKN, TN, Reactive P, Total P)	0.02, 0.01, 0.01, 0.01, 0.2, 0.2, 0.01, 0.01	\$55.00	5	\$275.00	1 x 500mL Plastic
Major Ions (Alkalinity, Chloride, Sulphate, Sodium, Potassium, Calcium, Magnesium, Hardness, Ion Balance)	5 mg CaCO3/L, 5, 1, 0.1, 0.1, 0.1, 0.1, 5 mg CaCO3/L	\$34.00	5	\$170.00	
Total Price (Exc GST)				\$775.00	

This quotation is valid until 31/12/2020
Please quote the above quotation number on COC with samples.



Natalie Hill | Key Account Manager | ARL Group
Phone: +61 8 6253 4444 | Mobile: +61 (0) 474 181 586
Email: nataliehill@arlgroupp.com.au

Quality Control Report

Job Number: 20-16048

Date: 23/09/2020



This report must not be reproduced except in full without prior written consent.

This Quality Control Report is issued in accordance with Section 18 of the ARL Quality Management Manual. All QC parameters are contained within the relevant ARL Method as indicated by the method reference, either on this report or the Laboratory Report.

Acceptance of Holding Times, Duplicate RPD, Spike, LCS and CRM Recoveries are determined at the time of analysis by the Signatory indicated on the Laboratory Report.

DEFINITIONS

Duplicate Analysis

A sample, chosen randomly by the analyst at the time of sample preparation, analysed in duplicate.

RPD

Relative Percent Difference is the absolute difference between the sample and a duplicate analysis compared to the average of the two analytical results. Acceptance Limits can be exceeded by matrix interference or when the result is less than 5 times the LOR.

Matrix Spike

An additional portion of sample to which known amounts of the target analytes are added before sample preparation. Acceptance Limits can be exceeded by matrix interference or when the target analytes are present in the sample.

Certified Reference Material (CRM)

A commercially available certified solution/mixture of the target analyte of known concentration.

Laboratory Control Sample (LCS)

An in-house certified solution/mixture of the target analyte of known concentration.

Quality Control Report

Job Number: 20-16048

Date: 23/09/2020



TRH (NEPM 2013) in Soil

Holding Time Criteria	Date	
Extracted	18/09/2020	
Analysed	21/09/2020	
Duplicate Analysis (20-16048-8)	RPD (%)	Limits (%)
Benzene	0	200
Toluene	0	200
Ethylbenzene	0	200
Xylenes (Total)	0	200
Naphthalene	0	200
TRHC ₆₋₁₀	0	200
TRHC ₆₋₁₀ minus BTEX (F1)	0	200
TRHC _{>10-16}	0	50
TRHC _{>10-16} minus Naphthalene (F2)	0	50
TRHC _{>16-34}	0	50
TRHC _{>34-40}	50	200
Duplicate Analysis (20-16048-20)	RPD (%)	Limits (%)
Benzene	0	200
Toluene	0	200
Ethylbenzene	0	200
Xylenes (Total)	0	200
Naphthalene	0	200
TRHC ₆₋₁₀	0	200
TRHC ₆₋₁₀ minus BTEX (F1)	0	200
TRHC _{>10-16}	22	200
TRHC _{>10-16} minus Naphthalene (F2)	22	200
TRHC _{>16-34}	0	200
TRHC _{>34-40}	0	200
Duplicate Analysis (20-16169-3)	RPD (%)	Limits (%)
Benzene	0	200
Toluene	0	200
Ethylbenzene	0	200
Xylenes (Total)	0	200
Naphthalene	0	200
TRHC ₆₋₁₀	0	200
TRHC ₆₋₁₀ minus BTEX (F1)	0	200
TRHC _{>10-16}	0	200
TRHC _{>10-16} minus Naphthalene (F2)	0	200
TRHC _{>16-34}	0	200
TRHC _{>34-40}	0	200
Duplicate Analysis (20-16259-1)	RPD (%)	Limits (%)
Benzene	0	200

Quality Control Report

Job Number: 20-16048

Date: 23/09/2020



Duplicate Analysis (20-16259-1)	RPD (%)	Limits (%)
Toluene	0	200
Ethylbenzene	0	200
Xylenes (Total)	0	200
Naphthalene	0	200
TRHC ₆₋₁₀	0	200
TRHC ₆₋₁₀ minus BTEX (F1)	0	200
TRHC>10-16	0	200
TRHC>10-16 minus Naphthalene (F2)	0	200
TRHC>16-34	0	200
TRHC>34-40	0	200
Blank Analysis	Result (mg/kg)	Limit (mg/kg)
Benzene	<0.1	0.1
Toluene	<0.1	0.1
Ethylbenzene	<0.1	0.1
Xylenes (Total)	<0.2	0.2
Naphthalene	<0.5	0.5
TRHC ₆₋₁₀	<2	2
TRHC ₆₋₁₀ minus BTEX (F1)	<2	2
TRHC>10-16	<20	20
TRHC>10-16 minus Naphthalene (F2)	<20	20
TRHC>16-34	<50	50
TRHC>34-40	<50	50
Blank Analysis	Result (mg/kg)	Limit (mg/kg)
Benzene	<0.1	0.1
Toluene	<0.1	0.1
Ethylbenzene	<0.1	0.1
Xylenes (Total)	<0.2	0.2
Naphthalene	<0.5	0.5
TRHC ₆₋₁₀	<2	2
TRHC ₆₋₁₀ minus BTEX (F1)	<2	2
TRHC>10-16	<20	20
TRHC>10-16 minus Naphthalene (F2)	<20	20
TRHC>16-34	<50	50
TRHC>34-40	<50	50
Laboratory Control Sample	Recovery (%)	Limits (%)
Benzene	79	70 - 140
Toluene	78	70 - 140
Ethylbenzene	73	70 - 140
Xylenes (Total)	74	70 - 140

Quality Control Report

Job Number: 20-16048

Date: 23/09/2020



Laboratory Control Sample	Recovery (%)	Limits (%)
Naphthalene	84	70 - 140
TRHC ₆₋₁₀	83	70 - 140
TRHC _{>10-16}	86	70 - 140
TRHC _{>16-34}	101	70 - 140
TRHC _{>34-40}	132	70 - 140
Laboratory Control Sample	Recovery (%)	Limits (%)
Benzene	89	70 - 140
Toluene	89	70 - 140
Ethylbenzene	85	70 - 140
Xylenes (Total)	86	70 - 140
Naphthalene	84	70 - 140
TRHC ₆₋₁₀	91	70 - 140
TRHC _{>10-16}	111	70 - 140
TRHC _{>16-34}	97	70 - 140
TRHC _{>34-40}	104	70 - 140

Mercury in Soils

Holding Time Criteria	Date	
Extracted	21/09/2020	
Analysed	22/09/2020	
Duplicate Analysis (20-15882-9)	RPD (%)	Limits (%)
Mercury	0	200
Duplicate Analysis (20-16023-18)	RPD (%)	Limits (%)
Mercury	0	200
Duplicate Analysis (20-16048-31)	RPD (%)	Limits (%)
Mercury	0	200
Duplicate Analysis (20-16266-1)	RPD (%)	Limits (%)
Mercury	0	200
Blank Analysis	Result (mg/kg)	Limit (mg/kg)
Mercury	<0.02	0.02
Matrix Spike (20-15882-9)	Recovery (%)	Limits (%)
Mercury	94	80 - 120
Matrix Spike (20-16023-18)	Recovery (%)	Limits (%)
Mercury	89	80 - 120
Matrix Spike (20-16048-31)	Recovery (%)	Limits (%)
Mercury	90	80 - 120
Certified Reference Material	Recovery (%)	Limits (%)
Mercury	95	80 - 120

Quality Control Report

Job Number: 20-16048

Date: 23/09/2020



Metals in Soil and Sediment

Holding Time Criteria	Date	
Extracted	21/09/2020	
Analysed	21/09/2020	
Duplicate Analysis (20-16023-18)	RPD (%)	Limits (%)
Cadmium	0	200
Chromium	0	25
Copper	13	50
Nickel	4	25
Lead	5	25
Zinc	3	25
Duplicate Analysis (20-16048-31)	RPD (%)	Limits (%)
Arsenic	0	200
Cadmium	0	200
Chromium	12	50
Copper	0	200
Nickel	0	200
Lead	0	50
Zinc	17	50
Duplicate Analysis (20-16249-2)	RPD (%)	Limits (%)
Arsenic	0	200
Cadmium	0	200
Chromium	0	200
Copper	0	200
Nickel	200	200
Lead	200	200
Zinc	0	200
Blank Analysis	Result (mg/kg)	Limit (mg/kg)
Arsenic	<5	5
Cadmium	<0.1	0.1
Chromium	<1	1
Copper	<1	1
Nickel	<1	1
Lead	<1	1
Zinc	<1	1
Matrix Spike (20-16023-18)	Recovery (%)	Limits (%)
Arsenic	80	80 - 120
Cadmium	120	80 - 120
Chromium	84	80 - 120
Copper	91	80 - 120
Nickel	80	80 - 120
Lead	80	80 - 120
Zinc	94	80 - 120
Matrix Spike (20-16048-31)	Recovery (%)	Limits (%)
Arsenic	88	80 - 120

Quality Control Report

Job Number: 20-16048

Date: 23/09/2020



Matrix Spike (20-16048-31)	Recovery (%)	Limits (%)
Cadmium	100	80 - 120
Chromium	96	80 - 120
Copper	87	80 - 120
Nickel	83	80 - 120
Lead	84	80 - 120
Zinc	85	80 - 120
Matrix Spike (20-16249-2)	Recovery (%)	Limits (%)
Arsenic	93	80 - 120
Cadmium	112	80 - 120
Chromium	92	80 - 120
Copper	93	80 - 120
Nickel	86	80 - 120
Lead	91	80 - 120
Zinc	97	80 - 120
Certified Reference Material	Recovery (%)	Limits (%)
Arsenic	106	80 - 120
Cadmium	116	80 - 120
Chromium	105	80 - 120
Copper	100	80 - 120
Nickel	102	80 - 120
Lead	101	80 - 120
Zinc	99	80 - 120

LABORATORY REPORT

Job Number: 20-16048
Revision: 00
Date: 23 September 2020

ADDRESS: **JBS&G Australia Pty Ltd**
Level 1, 50 Subiaco Square Road
Subiaco WA 6008



ATTENTION: Phil Bourgault

DATE RECEIVED: 16/09/2020

YOUR REFERENCE: 59422 - Workshops Ave DSI

PURCHASE ORDER:

APPROVALS:

 
Paul Nottle Sean Sangster
Organics Manager Inorganics Supervisor

REPORT COMMENTS:

This report is issued by Analytical Reference Laboratory (WA) Pty Ltd. The report shall not be reproduced except in full without written approval from the laboratory.

Samples are analysed on an as received basis unless otherwise noted.

Metals in soils analysis was conducted on a dry weight basis.

METHOD REFERENCES:

Methods prefixed with "ARL" are covered under NATA Accreditation Number: 2377
Methods prefixed with "PM" are covered under NATA Accreditation Number: 2561
Methods prefixed with "EDP" are covered under NATA Accreditation Number: 19290

Method ID	Method Description
ARL No. 192	Total Recoverable Hydrocarbons (C ₆ -C ₁₀) in Soil
ARL No. 193	Total Recoverable Hydrocarbons (>C ₁₀ -C ₄₀) in Soil
ARL No. 401/403	Metals in Soil and Sediment by ICPOES/MS
ARL No. 406	Mercury by Cold Vapour Atomic Absorption Spectrophotometry

JBS&G Australia Pty Ltd
Job No: 20-16048

LABORATORY REPORT

Revision: 00

Date: 23/09/20

TRH (C ₆ -C ₄₀) in Soil			Sample No	20-16048-1	20-16048-3	20-16048-4	20-16048-5	20-16048-7
Sample Description				TP01-0.1	TP01-2.0	TP02-0.1	QC01	TP02-2.0
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
Benzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylenes (Total)	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TRH C ₆₋₁₀	2	mg/kg	<2	<2	<2	<2	<2	<2
TRH C ₆₋₁₀ minus BTEX (F1)	2	mg/kg	<2	<2	<2	<2	<2	<2
TRH C _{>10-16}	20	mg/kg	<20	<20	<20	<20	<20	<20
TRH C _{>10-16} minus Naphthalene (F2)	20	mg/kg	<20	<20	<20	<20	<20	<20
TRH C _{>16-34}	50	mg/kg	<50	<50	<50	<50	<50	<50
TRH C _{>34-40}	50	mg/kg	<50	<50	<50	<50	<50	<50

TRH (C ₆ -C ₄₀) in Soil			Sample No	20-16048-8	20-16048-9	20-16048-11	20-16048-13	20-16048-14
Sample Description				TP03-0.1	TP03-1.0	TP04-0.1	TP04-2.0	TP05-0.1
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
Benzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylenes (Total)	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TRH C ₆₋₁₀	2	mg/kg	<2	<2	<2	<2	<2	<2
TRH C ₆₋₁₀ minus BTEX (F1)	2	mg/kg	<2	<2	<2	<2	<2	<2
TRH C _{>10-16}	20	mg/kg	170	<20	<20	<20	<20	<20
TRH C _{>10-16} minus Naphthalene (F2)	20	mg/kg	170	<20	<20	<20	<20	<20
TRH C _{>16-34}	50	mg/kg	410	<50	<50	<50	<50	<50
TRH C _{>34-40}	50	mg/kg	60	<50	<50	<50	<50	<50

TRH (C ₆ -C ₄₀) in Soil			Sample No	20-16048-15	20-16048-17	20-16048-19	20-16048-20	20-16048-22
Sample Description				TP05-1.0	TP06-0.1	TP06-2.0	TP07-0.1	TP07-2.0
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
Benzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylenes (Total)	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TRH C ₆₋₁₀	2	mg/kg	<2	<2	<2	<2	<2	<2
TRH C ₆₋₁₀ minus BTEX (F1)	2	mg/kg	<2	<2	<2	<2	<2	<2
TRH C _{>10-16}	20	mg/kg	<20	40	<20	40	<20	<20
TRH C _{>10-16} minus Naphthalene (F2)	20	mg/kg	<20	40	<20	40	<20	<20
TRH C _{>16-34}	50	mg/kg	<50	<50	<50	70	<50	<50
TRH C _{>34-40}	50	mg/kg	<50	<50	<50	<50	<50	<50

JBS&G Australia Pty Ltd

Job No: 20-16048

LABORATORY REPORT

Revision: 00

Date: 23/09/20

TRH (C ₆ -C ₄₀) in Soil			Sample No	20-16048-23	20-16048-24	20-16048-26	20-16048-28	20-16048-29
Sample Description				TP08-0.1	TP08-0.6	TP09-0.1	TP09-2.0	TP10-0.1
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
Benzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylenes (Total)	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TRH C ₆₋₁₀	2	mg/kg	<2	<2	<2	<2	<2	<2
TRH C ₆₋₁₀ minus BTEX (F1)	2	mg/kg	<2	<2	<2	<2	<2	<2
TRH C _{>10-16}	20	mg/kg	30	<20	60	<20	<20	<20
TRH C _{>10-16} minus Naphthalene (F2)	20	mg/kg	30	<20	60	<20	<20	<20
TRH C _{>16-34}	50	mg/kg	<50	<50	140	<50	<50	<50
TRH C _{>34-40}	50	mg/kg	<50	<50	<50	<50	<50	<50

TRH (C ₆ -C ₄₀) in Soil			Sample No	20-16048-31
Sample Description				TP10-2.0
Sample Date				15/09/2020
ANALYTE	LOR	Units	Result	Result
Benzene	0.1	mg/kg	<0.1	<0.1
Toluene	0.1	mg/kg	<0.1	<0.1
Ethylbenzene	0.1	mg/kg	<0.1	<0.1
Xylenes (Total)	0.2	mg/kg	<0.2	<0.2
Naphthalene	0.5	mg/kg	<0.5	<0.5
TRH C ₆₋₁₀	2	mg/kg	<2	<2
TRH C ₆₋₁₀ minus BTEX (F1)	2	mg/kg	<2	<2
TRH C _{>10-16}	20	mg/kg	<20	<20
TRH C _{>10-16} minus Naphthalene (F2)	20	mg/kg	<20	<20
TRH C _{>16-34}	50	mg/kg	<50	<50
TRH C _{>34-40}	50	mg/kg	<50	<50

8 Heavy Metals in Soil			Sample No	20-16048-1	20-16048-3	20-16048-4	20-16048-5	20-16048-7
Sample Description				TP01-0.1	TP01-2.0	TP02-0.1	QC01	TP02-2.0
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
Arsenic	5	mg/kg	<5	<5	<5	<5	<5	<5
Cadmium	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	1	mg/kg	8	19	22	16	21	21
Copper	1	mg/kg	15	<1	15	20	3	3
Mercury	0.02	mg/kg	0.05	0.04	0.04	0.04	0.04	0.02
Nickel	1	mg/kg	1	6	6	6	8	8
Lead	1	mg/kg	49	17	39	35	21	21
Zinc	1	mg/kg	9	3	37	44	3	3

ARL GROUP

46-48 Banksia Road, Welshpool, Western Australia 6106

Telephone: 08 6253 4444 Facsimile: 08 6253 4440 www.arlgroup.com.au

JBS&G Australia Pty Ltd
Job No: 20-16048

LABORATORY REPORT
Revision: 00

Date: 23/09/20

8 Heavy Metals in Soil			Sample No	20-16048-8	20-16048-9	20-16048-11	20-16048-13	20-16048-14
Sample Description				TP03-0.1	TP03-1.0	TP04-0.1	TP04-2.0	TP05-0.1
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
Arsenic	5	mg/kg	<5	<5	<5	<5	<5	<5
Cadmium	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	1	mg/kg	13	21	13	12	16	16
Copper	1	mg/kg	6	<1	6	<1	6	6
Mercury	0.02	mg/kg	0.03	0.03	0.02	<0.02	0.03	0.03
Nickel	1	mg/kg	5	7	5	4	6	6
Lead	1	mg/kg	15	17	19	12	21	21
Zinc	1	mg/kg	33	4	25	2	13	13

8 Heavy Metals in Soil			Sample No	20-16048-15	20-16048-17	20-16048-19	20-16048-20	20-16048-22
Sample Description				TP05-1.0	TP06-0.1	TP06-2.0	TP07-0.1	TP07-2.0
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
Arsenic	5	mg/kg	<5	<5	<5	<5	<5	<5
Cadmium	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	1	mg/kg	20	23	22	14	22	22
Copper	1	mg/kg	<1	8	3	9	1	1
Mercury	0.02	mg/kg	0.02	0.03	0.02	0.04	<0.02	<0.02
Nickel	1	mg/kg	7	8	7	5	6	6
Lead	1	mg/kg	16	20	26	28	15	15
Zinc	1	mg/kg	2	30	3	48	3	3

8 Heavy Metals in Soil			Sample No	20-16048-23	20-16048-24	20-16048-26	20-16048-28	20-16048-29
Sample Description				TP08-0.1	TP08-0.6	TP09-0.1	TP09-2.0	TP10-0.1
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
Arsenic	5	mg/kg	<5	<5	<5	<5	<5	<5
Cadmium	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	1	mg/kg	12	21	22	16	5	5
Copper	1	mg/kg	2	2	12	3	<1	<1
Mercury	0.02	mg/kg	<0.02	0.03	0.04	<0.02	<0.02	<0.02
Nickel	1	mg/kg	3	5	6	6	<1	<1
Lead	1	mg/kg	16	30	51	19	3	3
Zinc	1	mg/kg	19	5	37	4	3	3

8 Heavy Metals in Soil			Sample No	20-16048-31
Sample Description				TP10-2.0
Sample Date				15/09/2020
ANALYTE	LOR	Units	Result	Result
Arsenic	5	mg/kg	<5	<5
Cadmium	0.1	mg/kg	<0.1	<0.1
Chromium	1	mg/kg	9	9
Copper	1	mg/kg	<1	<1
Mercury	0.02	mg/kg	<0.02	<0.02
Nickel	1	mg/kg	<1	<1
Lead	1	mg/kg	5	5
Zinc	1	mg/kg	11	11

JBS&G Australia Pty Ltd

Job No: 20-16048

LABORATORY REPORT

Revision: 00

Date: 23/09/20

Result Definitions

LOR Limit of Reporting [NT] Not Tested

[ND] Not Detected at indicated Limit of Reporting

* Denotes test not covered by NATA Accreditation

FOR MICROBIOLOGICAL TESTING - The data in this report may not be representative of a lot, batch or other samples and may not necessarily justify the acceptance or rejection of a lot or batch, a product recall or support legal proceedings. Tests are not routinely performed as duplicates unless specifically requested. Changes occur in the bacterial content of biological samples. Samples should be examined as soon as possible after collection, preferably within 6 hrs and must be stored at 4 degrees Celsius or below. Samples tested after 24 hrs cannot be regarded as satisfactory because of temperature abuse and variations.

Strategen JBS&G
Level 1, 50 Subiaco Square Road
Subiaco WA 6008

22nd September 2020
ARL Ref: 20-16048-A

Asbestos in Soil w/w % - Project ID: 59422 – Workshops Ave DSI

Date Received: 16th September 2020

2 Soil samples submitted for analysis by Strategen JBS&G for asbestos identification

Analysis:

Qualitative identification of fibre type in bulk samples by Stereo Microscope Examination and Polarised Light Microscopy, including Dispersion Staining, using ARL in-house method ASBID and in accordance with AS4964-2004.

References:

The Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia May 2009

ARL Lab Number	Sample Identification	Approximate Sample weight (g)	Asbestos Detected (mg)	Approximate % Asbestos w/w
20-16048-A-1	TP01-0.1	560	<1	<0.001
20-16048-A-4	TP02-0.1	420	<1	<0.001

% Asbestos w/w not covered under scope of NATA accreditation



Adam Green
Occupational Hygiene Manager

LABORATORY REPORT

Job Number: 20-16048-A
Revision: 00
Date: 22 September 2020

ADDRESS: **JBS&G Australia Pty Ltd**
Level 1, 50 Subiaco Square Road
Subiaco WA 6008

ATTENTION: Phil Bourgault

DATE RECEIVED: 16/09/2020

YOUR REFERENCE: 59422 - Workshops Ave DSI

PURCHASE ORDER: 59422

APPROVALS:


Ivan Hodgson
Approved Identifier


Adam Green
Approved Signatory



SAMPLING COMMENTS:

Samples are analysed on an "as received" basis

METHOD REFERENCES:

Method ID	Method Description
ASBID	Qualitative identification of fibre type in bulk samples by Stereo Microscope Examination and Polarised Light Microscopy, including Dispersion Staining, using ARL in-house method ASBID and in accordance with AS4964-2004.

REPORT COMMENTS:

This report is issued by Analytical Reference Laboratory (WA) Pty Ltd. The report shall not be reproduced except in full without written approval from the laboratory.

This report is consistent with the analytical procedures in the Western Australia "Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009".

All soil samples received were sieved with a 2mm sieve. All fragments greater than 2mm are analysed. The portion of the sample less than 2mm is sub-sampled and the sub-sample is analysed. Subsampling increase the uncertainty associated with the analysis.

JBS&G Australia Pty Ltd
Job No: 20-16048-A

LABORATORY REPORT
Revision: 00

Date: 22/09/20

RESULTS:

Sample No	Sample ID	Sample Type	Sample Weight (Approx. g)	Subsample Weight (Approx. g)	Asbestos in Soil Sample
20-16048-A-1	TP01-0.1	Soil	560	120	Chrysotile Asbestos Detected Fibre Bundles < 1mg Organic Fibres Detected
20-16048-A-4	TP02-0.1	Soil	420	130	Chrysotile Asbestos Detected Fibre Bundles < 1mg Organic Fibres Detected

Quality Control Report

Job Number: 20-16048-B

Date: 29/09/2020



This report must not be reproduced except in full without prior written consent.

This Quality Control Report is issued in accordance with Section 18 of the ARL Quality Management Manual. All QC parameters are contained within the relevant ARL Method as indicated by the method reference, either on this report or the Laboratory Report.

Acceptance of Holding Times, Duplicate RPD, Spike, LCS and CRM Recoveries are determined at the time of analysis by the Signatory indicated on the Laboratory Report.

DEFINITIONS

Duplicate Analysis

A sample, chosen randomly by the analyst at the time of sample preparation, analysed in duplicate.

RPD

Relative Percent Difference is the absolute difference between the sample and a duplicate analysis compared to the average of the two analytical results. Acceptance Limits can be exceeded by matrix interference or when the result is less than 5 times the LOR.

Matrix Spike

An additional portion of sample to which known amounts of the target analytes are added before sample preparation. Acceptance Limits can be exceeded by matrix interference or when the target analytes are present in the sample.

Certified Reference Material (CRM)

A commercially available certified solution/mixture of the target analyte of known concentration.

Laboratory Control Sample (LCS)

An in-house certified solution/mixture of the target analyte of known concentration.

Quality Control Report

Job Number: 20-16048-B

Date: 29/09/2020



PAH in Soil

Holding Time Criteria	Date	
Extracted	24/09/2020	
Analysed	25/09/2020	
Duplicate Analysis (20-16048-B-8)	RPD (%)	Limits (%)
Naphthalene	0	200
2-Methylnaphthalene	0	200
Acenaphthylene	0	200
Acenaphthene	0	200
Fluorene	0	200
Phenanthrene	0	200
Anthracene	0	200
Fluoranthene	0	200
Pyrene	0	200
Benz(a)anthracene	0	200
Chrysene	0	200
Benzo(b)fluoranthene	0	200
Benzo(k)fluoranthene	0	200
Benzo(a)pyrene	0	200
Indeno(1,2,3-c,d)pyrene	0	200
Dibenz(a,h)anthracene	0	200
Benzo(ghi)perylene	0	200
Blank Analysis	Result (mg/kg)	Limit (mg/kg)
Naphthalene	<0.1	0.1
2-Methylnaphthalene	<0.1	0.1
Acenaphthylene	<0.1	0.1
Acenaphthene	<0.1	0.1
Fluorene	<0.1	0.1
Phenanthrene	<0.1	0.1
Anthracene	<0.1	0.1
Fluoranthene	<0.1	0.1
Pyrene	<0.1	0.1
Benz(a)anthracene	<0.2	0.2
Chrysene	<0.2	0.2
Benzo(b)fluoranthene	<0.2	0.2
Benzo(k)fluoranthene	<0.2	0.2
Benzo(a)pyrene	<0.2	0.2
Indeno(1,2,3-c,d)pyrene	<0.2	0.2
Dibenz(a,h)anthracene	<0.2	0.2
Benzo(ghi)perylene	<0.2	0.2
Matrix Spike (20-16048-B-8)	Recovery (%)	Limits (%)
Naphthalene	95	60 - 120

Quality Control Report

Job Number: 20-16048-B

Date: 29/09/2020

ARL Group
Proudly Western Australian

Matrix Spike (20-16048-B-8)	Recovery (%)	Limits (%)
Acenaphthene	98	60 - 120
Phenanthrene	103	60 - 120
Pyrene	99	60 - 120
Chrysene	103	60 - 120
Benzo(a)pyrene	115	60 - 120

Quality Control Report

Job Number: 20-16048-B

Date: 29/09/2020



TRH (NEPM 2013) in Soil

Holding Time Criteria	Date	
Extracted	24/09/2020	
Analysed	25/09/2020	
Duplicate Analysis (20-16448-23)	RPD (%)	Limits (%)
Benzene	0	200
Toluene	0	200
Ethylbenzene	0	200
Xylenes (Total)	0	200
Naphthalene	0	200
TRHC ₆₋₁₀	0	200
TRHC ₆₋₁₀ minus BTEX (F1)	0	200
Duplicate Analysis (20-16498-47)	RPD (%)	Limits (%)
Benzene	0	200
Toluene	0	200
Ethylbenzene	0	200
Xylenes (Total)	0	200
Naphthalene	0	200
TRHC ₆₋₁₀	0	200
TRHC ₆₋₁₀ minus BTEX (F1)	0	200
Blank Analysis	Result (mg/kg)	Limit (mg/kg)
Benzene	<0.1	0.1
Toluene	<0.1	0.1
Ethylbenzene	<0.1	0.1
Xylenes (Total)	<0.2	0.2
Naphthalene	<0.5	0.5
TRHC ₆₋₁₀	<2	2
TRHC ₆₋₁₀ minus BTEX (F1)	<2	2
TRH Silica (NEPM) C>10-16	<20	20
TRH Silica (NEPM) C>10-16 F2	<20	20
TRH Silica (NEPM) C>16-34	<50	50
TRH Silica (NEPM) C>34-40	<50	50
Blank Analysis	Result (mg/kg)	Limit (mg/kg)
Benzene	<0.1	0.1
Toluene	<0.1	0.1
Ethylbenzene	<0.1	0.1
Xylenes (Total)	<0.2	0.2
Naphthalene	<0.5	0.5
TRHC ₆₋₁₀	<2	2
TRHC ₆₋₁₀ minus BTEX (F1)	<2	2
Laboratory Control Sample	Recovery (%)	Limits (%)
Benzene	89	70 - 140

Quality Control Report

Job Number: 20-16048-B

Date: 29/09/2020



Laboratory Control Sample	Recovery (%)	Limits (%)
Toluene	89	70 - 140
Ethylbenzene	90	70 - 140
Xylenes (Total)	87	70 - 140
Naphthalene	113	70 - 140
TRHC ₆₋₁₀	105	70 - 140
TRH Silica (NEPM) C>10-16	122	70 - 140
TRH Silica (NEPM) C>16-34	116	70 - 140
TRH Silica (NEPM) C>34-40	126	70 - 140
Laboratory Control Sample	Recovery (%)	Limits (%)
Benzene	93	70 - 140
Toluene	92	70 - 140
Ethylbenzene	97	70 - 140
Xylenes (Total)	94	70 - 140
Naphthalene	72	70 - 140
TRHC ₆₋₁₀	115	70 - 140

LABORATORY REPORT

Job Number: 20-16048-B
Revision: 00
Date: 29 September 2020

ADDRESS: **JBS&G Australia Pty Ltd**
Level 1, 50 Subiaco Square Road
Subiaco WA 6008

ATTENTION: Phil Bourgault

DATE RECEIVED: 16/09/2020

YOUR REFERENCE: 59422 - Workshops Ave DSI

PURCHASE ORDER:

APPROVALS:



Paul Nottle
Organics Manager



Min How
Organics Supervisor

REPORT COMMENTS:

This report is issued by Analytical Reference Laboratory (WA) Pty Ltd. The report shall not be reproduced except in full without written approval from the laboratory.

Samples are analysed on an as received basis unless otherwise noted.

METHOD REFERENCES:

Methods prefixed with "ARL" are covered under NATA Accreditation Number: 2377
Methods prefixed with "PM" are covered under NATA Accreditation Number: 2561
Methods prefixed with "EDP" are covered under NATA Accreditation Number: 19290

Method ID	Method Description
ARL No. 006	Polycyclic Aromatic Hydrocarbons in Soil
ARL No. 192	Total Recoverable Hydrocarbons (C ₆ -C ₁₀) in Soil
ARL No. 193	Total Recoverable Hydrocarbons (>C ₁₀ -C ₄₀) in Soil



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JBS&G Australia Pty Ltd
Job No: 20-16048-B

LABORATORY REPORT
Revision: 00

Date: 29/09/20

PAH in Soil		Sample No	20-16048-B-8
Sample Description		TP03-0.1	
Sample Date		15/09/2020	
ANALYTE	LOR	Units	Result
Naphthalene	0.1	mg/kg	<0.1
2-Methylnaphthalene	0.1	mg/kg	<0.1
Acenaphthylene	0.1	mg/kg	0.1
Acenaphthene	0.1	mg/kg	<0.1
Fluorene	0.1	mg/kg	0.2
Phenanthrene	0.1	mg/kg	0.3
Anthracene	0.1	mg/kg	<0.1
Fluoranthene	0.1	mg/kg	<0.1
Pyrene	0.1	mg/kg	<0.1
Benz(a)anthracene	0.2	mg/kg	<0.2
Chrysene	0.2	mg/kg	<0.2
Benzo(b)fluoranthene	0.2	mg/kg	<0.2
Benzo(k)fluoranthene	0.2	mg/kg	<0.2
Benzo(a)pyrene	0.2	mg/kg	<0.2
Indeno(1,2,3-c,d)pyrene	0.2	mg/kg	<0.2
Dibenz(a,h)anthracene	0.2	mg/kg	<0.2
Benzo(ghi)perylene	0.2	mg/kg	<0.2

TRH Silica(C _{>10} -C ₄₀) in Soil		Sample No	20-16048-B-8	20-16048-B-17	20-16048-B-20	20-16048-B-23	20-16048-B-26
Sample Description		TP03-0.1		TP06-0.1	TP07-0.1	TP08-0.1	TP09-0.1
Sample Date		15/09/2020		15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result
Benzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Xylenes (Total)	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
TRH C ₆₋₁₀	2	mg/kg	<2	<2	<2	<2	<2
TRH C ₆₋₁₀ minus BTEX (F1)	2	mg/kg	<2	<2	<2	<2	<2
TRH Silica (NEPM) C _{>10-16}	20	mg/kg	110	<20	<20	<20	30
TRH Silica (NEPM) C _{>10-16} F2	20	mg/kg	110	<20	<20	<20	30
TRH Silica (NEPM) C _{>16-34}	50	mg/kg	<50	<50	<50	<50	<50
TRH Silica (NEPM) C _{>34-40}	50	mg/kg	<50	<50	<50	<50	<50

Result Definitions

LOR Limit of Reporting [NT] Not Tested

[ND] Not Detected at indicated Limit of Reporting

* Denotes test not covered by NATA Accreditation

FOR MICROBIOLOGICAL TESTING - The data in this report may not be representative of a lot, batch or other samples and may not necessarily justify the acceptance or rejection of a lot or batch, a product recall or support legal proceedings. Tests are not routinely performed as duplicates unless specifically requested. Changes occur in the bacterial content of biological samples. Samples should be examined as soon as possible after collection, preferably within 6 hrs and must be stored at 4 degrees Celsius or below. Samples tested after 24 hrs cannot be regarded as satisfactory because of temperature abuse and variations.

Quality Control Report

Job Number: 20-16048-C

Date: 19/10/2020



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This Quality Control Report is issued in accordance with Section 18 of the ARL Quality Management Manual. All QC parameters are contained within the relevant ARL Method as indicated by the method reference, either on this report or the Laboratory Report.

Acceptance of Holding Times, Duplicate RPD, Spike, LCS and CRM Recoveries are determined at the time of analysis by the Signatory indicated on the Laboratory Report.

DEFINITIONS

Duplicate Analysis

A sample, chosen randomly by the analyst at the time of sample preparation, analysed in duplicate.

RPD

Relative Percent Difference is the absolute difference between the sample and a duplicate analysis compared to the average of the two analytical results. Acceptance Limits can be exceeded by matrix interference or when the result is less than 5 times the LOR.

Matrix Spike

An additional portion of sample to which known amounts of the target analytes are added before sample preparation. Acceptance Limits can be exceeded by matrix interference or when the target analytes are present in the sample.

Certified Reference Material (CRM)

A commercially available certified solution/mixture of the target analyte of known concentration.

Laboratory Control Sample (LCS)

An in-house certified solution/mixture of the target analyte of known concentration.

Quality Control Report

Job Number: 20-16048-C

Date: 19/10/2020



'Field' pH in Acid Sulphate Soils

Holding Time Criteria	Date	
Analysed	15/10/2020	
Duplicate Analysis (20-16048-C-10)	RPD (%)	Limits (%)
pH _f (23Af)	0	25
pH _{fox} (23Bf)	0	25
Duplicate Analysis (20-16048-C-20)	RPD (%)	Limits (%)
pH _f (23Af)	2	25
pH _{fox} (23Bf)	0	25
Duplicate Analysis (20-16048-C-30)	RPD (%)	Limits (%)
pH _f (23Af)	0	25
pH _{fox} (23Bf)	2	25
Duplicate Analysis (20-17553-1)	RPD (%)	Limits (%)
pH _f (23Af)	2	25
pH _{fox} (23Bf)	5	25
Blank Analysis	Result (pH units)	Limit (pH units)
pH _f (23Af)	5.4	0.1
pH _{fox} (23Bf)	4.6	0.1
Blank Analysis	Result (pH units)	Limit (pH units)
pH _f (23Af)	5.3	0.1
pH _{fox} (23Bf)	4.6	0.1
Certified Reference Material	Recovery (%)	Limits (%)
pH _f (23Af)	100	95 - 105
pH _{fox} (23Bf)	100	95 - 105
pH _f (23Af)	100	95 - 105
pH _{fox} (23Bf)	100	95 - 105

LABORATORY REPORT

Job Number: 20-16048-C
Revision: 00
Date: 19 October 2020

ADDRESS: **JBS&G Australia Pty Ltd**
Level 1, 50 Subiaco Square Road
Subiaco WA 6008

ATTENTION: Phil Bourgault

DATE RECEIVED: 16/09/2020

YOUR REFERENCE: 59422 - Workshops Ave DSI

PURCHASE ORDER:

APPROVALS:



Sean Sangster
Inorganics Supervisor

REPORT COMMENTS:

This report is issued by Analytical Reference Laboratory (WA) Pty Ltd. The report shall not be reproduced except in full without written approval from the laboratory.

Samples are analysed on an as received basis unless otherwise noted.

Rates of Reaction are determined by visual observation and are based on
Acid Sulphate Soils Laboratory Methods Guidelines: Section H - Table H1.1

RATES OF REACTION

Slight Reaction = X

Moderate Reaction = XX

Vigorous Reaction = XXX

Very Vigorous Reaction = XXXX

METHOD REFERENCES:

Method ID	Method Description
ARL No. 208	"Field" pH measurements
23A and 23B	QASSIT et al Method Code

JBS&G Australia Pty Ltd
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Acid Sulfate Soils			Sample No	20-16048-C-1	20-16048-C-2	20-16048-C-3	20-16048-C-4	20-16048-C-5
Sample Description				TP01-0.1	TP01-1.0	TP01-2.0	TP02-0.1	QC01
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
pH _f (23Af)	0.1	pH units	7.7	6.0	5.8	6.9	7.5	
pH _{fox} (23Bf)	0.1	pH units	5.4	4.4	4.2	4.0	4.5	
Rate of Reaction			XX	XX	X	XXXX	XXX	

Acid Sulfate Soils			Sample No	20-16048-C-6	20-16048-C-7	20-16048-C-8	20-16048-C-9	20-16048-C-10
Sample Description				TP02-1.0	TP02-2.0	TP03-0.1	TP03-1.0	TP03-2.0
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
pH _f (23Af)	0.1	pH units	5.9	5.5	6.6	5.6	6.0	
pH _{fox} (23Bf)	0.1	pH units	4.7	4.2	4.3	4.2	4.3	
Rate of Reaction			X	X	XXXX	XX	XX	

Acid Sulfate Soils			Sample No	20-16048-C-11	20-16048-C-12	20-16048-C-13	20-16048-C-14	20-16048-C-15
Sample Description				TP04-0.1	TP04-0.5	TP04-2.0	TP05-0.1	TP05-1.0
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
pH _f (23Af)	0.1	pH units	6.3	5.9	5.7	5.4	5.2	
pH _{fox} (23Bf)	0.1	pH units	3.9	4.2	4.1	3.5	4.0	
Rate of Reaction			XXXX	XX	X	XXXX	XX	

Acid Sulfate Soils			Sample No	20-16048-C-16	20-16048-C-17	20-16048-C-18	20-16048-C-19	20-16048-C-20
Sample Description				TP05-2.0	TP06-0.1	TP06-0.6	TP06-2.0	TP07-0.1
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
pH _f (23Af)	0.1	pH units	5.6	6.3	5.8	6.4	6.2	
pH _{fox} (23Bf)	0.1	pH units	4.3	4.3	4.3	6.3	4.0	
Rate of Reaction			X	XXXX	XX	XXXX	XXXX	

Acid Sulfate Soils			Sample No	20-16048-C-21	20-16048-C-22	20-16048-C-23	20-16048-C-24	20-16048-C-25
Sample Description				TP07-1.0	TP07-2.0	TP08-0.1	TP08-0.6	TP08-2.0
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
pH _f (23Af)	0.1	pH units	5.6	5.2	7.5	7.2	5.5	
pH _{fox} (23Bf)	0.1	pH units	4.1	3.9	5.7	5.3	4.1	
Rate of Reaction			XX	X	XXX	XX	X	

Acid Sulfate Soils			Sample No	20-16048-C-26	20-16048-C-27	20-16048-C-28	20-16048-C-29	20-16048-C-30
Sample Description				TP09-0.1	TP09-1.0	TP09-2.0	TP10-0.1	TP10-1.0
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result	Result
pH _f (23Af)	0.1	pH units	5.7	5.8	5.4	7.3	7.5	
pH _{fox} (23Bf)	0.1	pH units	3.4	4.9	4.4	5.0	5.3	
Rate of Reaction			XXXX	XX	X	X	X	

JBS&G Australia Pty Ltd

Job No: 20-16048-C

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Acid Sulfate Soils		Sample No	20-16048-C-31
		Sample Description	TP10-2.0
		Sample Date	15/09/2020
ANALYTE	LOR	Units	Result
pH _f (23Af)	0.1	pH units	8.1
pH _{iox} (23Bf)	0.1	pH units	5.9
Rate of Reaction			X

Result Definitions

LOR Limit of Reporting

[NT] Not Tested

[ND] Not Detected at indicated Limit of Reporting

* Denotes test conducted by in-house methodology.

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Quality Control Report

Job Number: 20-16048-D

Date: 11/11/2020



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This Quality Control Report is issued in accordance with Section 18 of the ARL Quality Management Manual. All QC parameters are contained within the relevant ARL Method as indicated by the method reference, either on this report or the Laboratory Report.

Acceptance of Holding Times, Duplicate RPD, Spike, LCS and CRM Recoveries are determined at the time of analysis by the Signatory indicated on the Laboratory Report.

DEFINITIONS

Duplicate Analysis

A sample, chosen randomly by the analyst at the time of sample preparation, analysed in duplicate.

RPD

Relative Percent Difference is the absolute difference between the sample and a duplicate analysis compared to the average of the two analytical results. Acceptance Limits can be exceeded by matrix interference or when the result is less than 5 times the LOR.

Matrix Spike

An additional portion of sample to which known amounts of the target analytes are added before sample preparation. Acceptance Limits can be exceeded by matrix interference or when the target analytes are present in the sample.

Certified Reference Material (CRM)

A commercially available certified solution/mixture of the target analyte of known concentration.

Laboratory Control Sample (LCS)

An in-house certified solution/mixture of the target analyte of known concentration.

Quality Control Report

Job Number: 20-16048-D

Date: 11/11/2020



Chromium Reducible Sulphur in Soil

Holding Time Criteria	Date	
Analysed	6/11/2020	
Duplicate Analysis (20-16048-D-4)	RPD (%)	Limits (%)
Chromium Reducible Sulfur (22B)	0	200
Blank Analysis	Result (% S)	Limit (% S)
Chromium Reducible Sulfur (22B)	<0.01	0.01
Laboratory Control Sample	Recovery (%)	Limits (%)
Chromium Reducible Sulfur (22B)	84	80 - 120

pH KCL and TAA in Soil

Holding Time Criteria	Date	
Extracted	6/11/2020	
Analysed	6/11/2020	
Duplicate Analysis (20-16048-D-26)	RPD (%)	Limits (%)
pH _{KCl} (23A)	2	25
Titrateable Actual Acidity (23F)	0	25
Blank Analysis	Result (pH Units)	Limit (pH Units)
pH _{KCl} (23A)	6.0	0.1
Titrateable Actual Acidity (23F)	<2	2
Laboratory Control Sample	Recovery (%)	Limits (%)
pH _{KCl} (23A)	99	80 - 120
Titrateable Actual Acidity (23F)	109	80 - 120

Sulphur in TAA and TPA ASS

Holding Time Criteria	Date	
Extracted	10/11/2020	
Analysed	10/11/2020	
Duplicate Analysis (20-16048-D-26)	RPD (%)	Limits (%)
KCl Extractable Sulfur (23Ce)	0	200
Blank Analysis	Result (% S)	Limit (% S)
KCl Extractable Sulfur (23Ce)	<0.005	0.005
Laboratory Control Sample	Recovery (%)	Limits (%)
KCl Extractable Sulfur (23Ce)	87	80 - 120
Duplicate Analysis (20-16048-D-26)	RPD (%)	Limits (%)
Peroxide Extractable Sulfur (23De)	3	25
Blank Analysis	Result (% S)	Limit (% S)
Peroxide Extractable Sulfur (23De)	<0.005	0.005
Laboratory Control Sample	Recovery (%)	Limits (%)
Peroxide Extractable Sulfur (23De)	91	80 - 120

Quality Control Report

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pHox and TPA in Soil

Holding Time Criteria	Date	
Extracted	6/11/2020	
Analysed	6/11/2020	
Duplicate Analysis (20-16048-D-26)	RPD (%)	Limits (%)
pHox (23B)	2	25
Titrateable Peroxide Acidity (23G)	0	25
Blank Analysis	Result (pH Units)	Limit (pH Units)
pHox (23B)	6.1	0.1
Titrateable Peroxide Acidity (23G)	<2	2
Excess Acid Neutral. Capacity (23Q)	<0.02	0.02
Laboratory Control Sample	Recovery (%)	Limits (%)
pHox (23B)	95	80 - 120
Titrateable Peroxide Acidity (23G)	95	80 - 120

Ca and Mg in TAA and TPA ASS

Holding Time Criteria	Date	
Extracted	9/11/2020	
Analysed	10/11/2020	
Duplicate Analysis (20-16048-D-26)	RPD (%)	Limits (%)
KCl Extractable Calcium (23Vh)	0	25
Peroxide Extractable Calcium (23Wh)	0	25
KCl Extractable Magnesium (23Sm)	6	50
Peroxide Extractable Magnesium (23Tm)	6	50
Blank Analysis	Result (% Ca)	Limit (% Ca)
KCl Extractable Calcium (23Vh)	<0.005	0.005
Peroxide Extractable Calcium (23Wh)	<0.005	0.005
KCl Extractable Magnesium (23Sm)	<0.005	0.005
Peroxide Extractable Magnesium (23Tm)	<0.005	0.005
Laboratory Control Sample	Recovery (%)	Limits (%)
KCl Extractable Calcium (23Vh)	91	80 - 120
Peroxide Extractable Calcium (23Wh)	87	80 - 120
KCl Extractable Magnesium (23Sm)	93	80 - 120
Peroxide Extractable Magnesium (23Tm)	98	80 - 120

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Subiaco WA 6008

ATTENTION: Phil Bourgault

DATE RECEIVED: 16/09/2020

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PURCHASE ORDER:

APPROVALS:


Kim Rodgers
General Manager**REPORT COMMENTS:**

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METHOD REFERENCES:

Methods prefixed with "ARL" are covered under NATA Accreditation Number: 2377
Methods prefixed with "PM" are covered under NATA Accreditation Number: 2561
Methods prefixed with "EDP" are covered under NATA Accreditation Number: 19290

Method ID	Method Description
ARL No. 201	KCL Extractable pH and TAA
ARL No. 204	Sulfur, Calcium and Magnesium by KCl Extraction
ARL No. 205	Sulfur, Calcium and Magnesium by 4M HCl Extraction
ARL No. 207	Chromium Reducible Sulfur
ARL No. 136	Lime Equivalence in Biosolids
ARL No. 210	Acid Sulfate Soils Method Codes and Further Calculations
ARL No. 202	Peroxide Extractable pH, TPA and ANCe
ARL No. 203	Sulfur, Calcium and Magnesium by Peroxide Extraction

JBS&G Australia Pty Ltd
Job No: 20-16048-D

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Date: 11/11/20

Chromium Reducible Sulfur		Sample No	20-16048-D-4
Sample Description		TP02-0.1	
Sample Date		15/09/2020	
ANALYTE	LOR	Units	Result
pH _{KCl} (23A)	0.1	pH Units	6.7
Titrateable Actual Acidity (23F)	2	mol H ⁺ /t	<2
Sulphidic - TAA (s-23F)	0.005	% Pyrite Sulfur	<0.005
KCl Extractable Sulfur (23Ce)	0.005	% S	<0.005
HCl Extractable Sulfur (20Be)	0.005	% S	NOT REQUIRED
Net Acid Soluble Sulfur (23J)	0.005	% S	NOT REQUIRED
Net Acid Soluble Sulfur (a-23J)	4	mole H ⁺ /t	NOT REQUIRED
Net Acid Soluble Sulfur (s-23J)	0.005	% Pyrite S	NOT REQUIRED
Chromium Reducible Sulfur (22B)	0.01	% S	<0.01
Chromium Reducible Sulfur (a-22B)	8	mole H ⁺ /t	<8
Acid Neutralising Capacity BT (19A2)	0.05	% CaCO ₃	1.0
Acid Neutralising Capacity BT (a-19A2)	10	mole H ⁺ /t	200
Acid Neutralising Capacity BT (s-19A2)	0.02	% Pyrite S	0.32
ANC Fineness Factor	0.5	-	1.5
Net Acidity	0.01	% S	<0.01
Net Acidity	10	mole H ⁺ /t	<10
Liming Rate	1	kg CaCO ₃ /t	<1
Net Acidity excluding ANC	0.01	% S	<0.01
Net Acidity excluding ANC	10	mole H ⁺ /t	<10
Liming Rate excluding ANC	1	kg CaCO ₃ /t	<1

SPOCAS Suite		Sample No	20-16048-D-6	20-16048-D-13	20-16048-D-14	20-16048-D-22	20-16048-D-25
Sample Description		TP02-1.0		TP04-2.0	TP05-0.1	TP07-2.0	TP08-2.0
Sample Date		15/09/2020		15/09/2020	15/09/2020	15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result	Result	Result
pH _{KCl} (23A)	0.1	pH Units	5.1	4.7	4.5	4.7	5.8
pH _{ox} (23B)	0.1	pH Units	5.0	5.2	3.9	5.6	6.3
Titrateable Actual Acidity (23F)	2	mol H ⁺ /t	14	15	40	22	9
Titrateable Peroxide Acidity (23G)	2	mol H ⁺ /t	14	15	59	22	9
Titrateable Sulphidic Acidity (23H)	2	mol H ⁺ /t	<2	<2	19	<2	<2
Sulphidic - TAA (s-23F)	0.005	% Pyrite Sulfur	0.022	0.024	0.064	0.035	0.014
Sulphidic - TPA (s-23G)	0.005	% Pyrite Sulfur	0.022	0.024	0.095	0.035	0.014
Sulphidic - TSA (s-23H)	0.005	% Pyrite Sulfur	<0.005	<0.005	0.030	<0.005	<0.005
KCl Extractable Sulfur (23Ce)	0.005	% S	0.009	0.009	<0.005	<0.005	0.009
Peroxide Extractable Sulfur (23De)	0.005	% S	0.014	0.009	0.013	0.006	0.011

JBS&G Australia Pty Ltd

Job No: 20-16048-D

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SPOCAS Suite			Sample No	20-16048-D-6	20-16048-D-13	20-16048-D-14	20-16048-D-22	20-16048-D-25
Sample Description				TP02-1.0	TP04-2.0	TP05-0.1	TP07-2.0	TP08-2.0
Sample Date				15/09/2020	15/09/2020	15/09/2020	15/09/2020	15/09/2020
Peroxide Oxidisable Sulfur (23Ee)	0.005	% S		0.005	<0.005	0.013	0.006	<0.005
Acidic S _{pos} (a-23Ee)	4	mol H ⁺ /t		<4	<4	8	<4	<4
Residual Acid Soluble Sulfur (23Re)	0.005	% S		NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
S _{ras} - Pyrite S (s-23Re)	0.005	% Pyrite S		NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
S _{ras} - Acidic (a-23Re)	4	mol H ⁺ /t		NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
KCl Extractable Calcium (23Vh)	0.005	% Ca		0.028	0.024	0.028	0.028	0.061
Peroxide Extractable Calcium (23Wh)	0.005	% Ca		0.030	0.028	0.042	0.030	0.075
Acid Reacted Calcium (23Xh)	0.005	% Ca		<0.005	<0.005	0.014	<0.005	0.014
Acidity - Ca (a-23Xh)	4	mol H ⁺ /t		<4	<4	7	<4	7
Sulphidic - Ca (s-23Xh)	0.005	% Pyrite S		<0.005	<0.005	0.011	<0.005	0.011
KCl Extractable Magnesium (23Sm)	0.005	% Mg		0.056	0.098	0.026	0.10	0.071
Peroxide Extractable Magnesium (23Tm)	0.005	% Mg		0.063	0.11	0.031	0.10	0.080
Acid Reacted Magnesium (23Um)	0.005	% Mg		0.007	0.012	0.005	<0.005	0.009
Acidity - Mg (a-23Um)	4	mol H ⁺ /t		6	10	4	<4	7
Sulphidic - Mg (s-23Um)	0.005	% Pyrite S		0.009	0.016	0.007	<0.005	0.012
Excess Acid Neutral. Capacity (23Q)	0.02	% CaCO ₃		NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
Excess ANC - Acidity (a-23Q)	4	mole H ⁺ /t		NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
Excess ANC - Sulphidic (s-23Q)	0.005	% Pyrite S		NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
ANC Fineness Factor	0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity excluding ANC	0.005	% S		0.027	0.024	0.077	0.041	0.014
Net Acidity excluding ANC	5	mole H ⁺ /t		17	15	48	26	9
Liming Rate excluding ANC	1	kg CaCO ₃ /t		2	2	7	4	1
Net Acidity	0.005	% S		0.027	0.024	0.077	0.041	0.014
Net Acidity	5	mole H ⁺ /t		17	15	48	26	9
Liming Rate	1	kg CaCO ₃ /t		2	2	7	4	1

SPOCAS Suite			Sample No	20-16048-D-26
Sample Description				TP09-0.1
Sample Date				15/09/2020
ANALYTE	LOR	Units	Result	
pH _{KCl} (23A)	0.1	pH Units	5.2	
pH _{ox} (23B)	0.1	pH Units	5.3	
Titrateable Actual Acidity (23F)	2	mol H ⁺ /t	16	
Titrateable Peroxide Acidity (23G)	2	mol H ⁺ /t	16	
Titrateable Sulphidic Acidity (23H)	2	mol H ⁺ /t	<2	
Sulphidic - TAA (s-23F)	0.005	% Pyrite Sulfur	0.026	
Sulphidic - TPA (s-23G)	0.005	% Pyrite Sulfur	0.026	
Sulphidic - TSA (s-23H)	0.005	% Pyrite Sulfur	<0.005	

ARL GROUP

46-48 Banksia Road, Welshpool, Western Australia 6106

Telephone: 08 6253 4444 Facsimile: 08 6253 4440 www.arlgroup.com.au

JBS&G Australia Pty Ltd

Job No: 20-16048-D

LABORATORY REPORT

Revision: 00

Date: 11/11/20

SPOCAS Suite		Sample No	20-16048-D-26
Sample Description		TP09-0.1	
Sample Date		15/09/2020	
KCl Extractable Sulfur (23Ce)	0.005	% S	<0.005
Peroxide Extractable Sulfur (23De)	0.005	% S	0.032
Peroxide Oxidisable Sulfur (23Ee)	0.005	% S	0.032
Acidic S _{pos} (a-23Ee)	4	mol H ⁺ /t	20
Residual Acid Soluble Sulfur (23Re)	0.005	% S	NOT REQUIRED
S _{ras} - Pyrite S (s-23Re)	0.005	% Pyrite S	NOT REQUIRED
S _{ras} - Acidic (a-23Re)	4	mol H ⁺ /t	NOT REQUIRED
KCl Extractable Calcium (23Vh)	0.005	% Ca	0.13
Peroxide Extractable Calcium (23Wh)	0.005	% Ca	0.13
Acid Reacted Calcium (23Xh)	0.005	% Ca	<0.005
Acidity - Ca (a-23Xh)	4	mol H ⁺ /t	<4
Sulphidic - Ca (s-23Xh)	0.005	% Pyrite S	<0.005
KCl Extractable Magnesium (23Sm)	0.005	% Mg	0.046
Peroxide Extractable Magnesium (23Tm)	0.005	% Mg	0.053
Acid Reacted Magnesium (23Um)	0.005	% Mg	0.007
Acidity - Mg (a-23Um)	4	mol H ⁺ /t	6
Sulphidic - Mg (s-23Um)	0.005	% Pyrite S	0.009
Excess Acid Neutral Capacity (23Q)	0.02	% CaCO ₃	NOT REQUIRED
Excess ANC - Acidity (a-23Q)	4	mole H ⁺ /t	NOT REQUIRED
Excess ANC - Sulphidic (s-23Q)	0.005	% Pyrite S	NOT REQUIRED
ANC Fineness Factor	0.5	-	1.5
Net Acidity excluding ANC	0.005	% S	0.058
Net Acidity excluding ANC	5	mole H ⁺ /t	36
Liming Rate excluding ANC	1	kg CaCO ₃ /t	5
Net Acidity	0.005	% S	0.058
Net Acidity	5	mole H ⁺ /t	36
Liming Rate	1	kg CaCO ₃ /t	5

Result Definitions

LOR Limit of Reporting

[NT] Not Tested

[ND] Not Detected at indicated Limit of Reporting

* Denotes test not covered by NATA Accreditation

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Telephone: 08 6253 4444 Facsimile: 08 6253 4440 www.arlgroup.com.au

Quality Control Report

Job Number: 20-16048-E

Date: 17/11/2020



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DEFINITIONS

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RPD

Relative Percent Difference is the absolute difference between the sample and a duplicate analysis compared to the average of the two analytical results. Acceptance Limits can be exceeded by matrix interference or when the result is less than 5 times the LOR.

Matrix Spike

An additional portion of sample to which known amounts of the target analytes are added before sample preparation. Acceptance Limits can be exceeded by matrix interference or when the target analytes are present in the sample.

Certified Reference Material (CRM)

A commercially available certified solution/mixture of the target analyte of known concentration.

Laboratory Control Sample (LCS)

An in-house certified solution/mixture of the target analyte of known concentration.

Quality Control Report

Job Number: 20-16048-E

Date: 17/11/2020



Chromium Reducible Sulphur in Soil

Holding Time Criteria	Date	
Analysed	12/11/2020	
Duplicate Analysis (20-16048-E-14)	RPD (%)	Limits (%)
Chromium Reducible Sulfur (22B)	0	200
Blank Analysis	Result (% S)	Limit (% S)
Chromium Reducible Sulfur (22B)	<0.01	0.01
Laboratory Control Sample	Recovery (%)	Limits (%)
Chromium Reducible Sulfur (22B)	98	80 - 120

LABORATORY REPORT

Job Number: 20-16048-E
Revision: 00
Date: 17 November 2020

ADDRESS: **JBS&G Australia Pty Ltd**
Level 1, 50 Subiaco Square Road
Subiaco WA 6008

ATTENTION: Phil Bourgault

DATE RECEIVED: 16/09/2020

YOUR REFERENCE: 59422 - Workshops Ave DSI

PURCHASE ORDER:

APPROVALS:



Sam Becker
Inorganics Manager

REPORT COMMENTS:

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Samples are analysed on an as received basis unless otherwise noted.

Samples were analysed on a dried and ground basis.

METHOD REFERENCES:

Methods prefixed with "ARL" are covered under NATA Accreditation Number: 2377
Methods prefixed with "PM" are covered under NATA Accreditation Number: 2561
Methods prefixed with "EDP" are covered under NATA Accreditation Number: 19290

Method ID	Method Description
ARL No. 135	Moisture
ARL No. 201	KCL Extractable pH and TAA
ARL No. 204	Sulfur, Calcium and Magnesium by KCl Extraction
ARL No. 205	Sulfur, Calcium and Magnesium by 4M HCl Extraction
ARL No. 207	Chromium Reducible Sulfur
ARL No. 136	Lime Equivalence in Biosolids
ARL No. 210	Acid Sulfate Soils Method Codes and Further Calculations

JBS&G Australia Pty Ltd
Job No: 20-16048-E

LABORATORY REPORT
Revision: 00

Date: 17/11/20

Chromium Reducible Sulfur			Sample No	20-16048-E-14	20-16048-E-22
Sample Description				TP05-0.1	TP07-2.0
Sample Date				15/09/2020	15/09/2020
ANALYTE	LOR	Units	Result	Result	Result
Moisture	0.1	%w/w	<0.1	<0.1	<0.1
pH _{KCl} (23A)	0.1	pH Units	4.5	4.5	4.7
Titrateable Actual Acidity (23F)	2	mol H ⁺ /t	40	40	22
Sulphidic - TAA (s-23F)	0.005	% Pyrite Sulfur	0.064	0.064	0.035
KCl Extractable Sulfur (23Ce)	0.005	% S	0.064	0.064	0.035
HCl Extractable Sulfur (20Be)	0.005	% S	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
Net Acid Soluble Sulfur (23J)	0.005	% S	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
Net Acid Soluble Sulfur (a-23J)	4	mole H ⁺ /t	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
Net Acid Soluble Sulfur (s-23J)	0.005	% Pyrite S	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
Chromium Reducible Sulfur (22B)	0.01	% S	<0.01	<0.01	<0.01
Chromium Reducible Sulfur (a-22B)	8	mole H ⁺ /t	<8	<8	<8
Acid Neutralising Capacity BT (19A2)	0.05	% CaCO ₃	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
Acid Neutralising Capacity BT (a-19A2)	10	mole H ⁺ /t	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
Acid Neutralising Capacity BT (s-19A2)	0.02	% Pyrite S	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
ANC Fineness Factor	0.5	-	1.5	1.5	1.5
Net Acidity	0.01	% S	0.06	0.06	0.04
Net Acidity	10	mole H ⁺ /t	40	40	30
Liming Rate	1	kg CaCO ₃ /t	5	5	3
Net Acidity excluding ANC	0.01	% S	0.06	0.06	0.04
Net Acidity excluding ANC	10	mole H ⁺ /t	40	40	30
Liming Rate excluding ANC	1	kg CaCO ₃ /t	5	5	3

Result Definitions

LOR Limit of Reporting [NT] Not Tested [ND] Not Detected at indicated Limit of Reporting

* Denotes test not covered by NATA Accreditation

FOR MICROBIOLOGICAL TESTING - The data in this report may not be representative of a lot, batch or other samples and may not necessarily justify the acceptance or rejection of a lot or batch, a product recall or support legal proceedings. Tests are not routinely performed as duplicates unless specifically requested. Changes occur in the bacterial content of biological samples. Samples should be examined as soon as possible after collection, preferably within 6 hrs and must be stored at 4 degrees Celsius or below. Samples tested after 24 hrs cannot be regarded as satisfactory because of temperature abuse and variations.

CERTIFICATE OF ANALYSIS 250171

Client Details

Client	Strategen - JBS&G
Attention	Phil Bourgault
Address	Level 1, 50 Subiaco Square Road, SUBIACO, WA, 6008

Sample Details

Your Reference	<u>59422 - Workshops Ave DSI</u>
Number of Samples	1 Soil
Date samples received	15/09/2020
Date completed instructions received	15/09/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by 21/09/2020

Date of Issue 21/09/2020

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By

David Williams, Group Organics Manager
 Heram Halim, Operations Manager
 Huong Tran, Chemist

Authorised By



Michael Kubiak, Laboratory Manager

vTRH(C6-C10)/MBTEXN in soil		
Our Reference		250171-1
Your Reference	UNITS	QC02
Date Sampled		15/09/2020
Type of sample		Soil
Date extracted	-	16/09/2020
Date analysed	-	17/09/2020
TRH C ₆ - C ₉	mg/kg	<25
TRH C ₆ - C ₁₀	mg/kg	<25
TRH C ₆ -C ₁₀ less BTEX (F1)	mg/kg	<25
MTBE	mg/kg	<0.5
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-xylene	mg/kg	<1
Naphthalene	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	96

svTRH(C10-C36) in soil		
Our Reference	UNITS	250171-1
Your Reference		QC02
Date Sampled		15/09/2020
Type of sample		Soil
Date extracted	-	16/09/2020
Date analysed	-	17/09/2020
TRH C ₁₀ - C ₁₄	mg/kg	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100
TRH >C ₁₀ - C ₁₆	mg/kg	<50
TRH >C ₁₀ -C ₁₆ less N (F2)	mg/kg	<50
TRH >C ₁₆ - C ₃₄	mg/kg	<100
TRH >C ₃₄ - C ₄₀	mg/kg	<100
Surrogate o-Terphenyl	%	91

Acid Extractable metals in soil		
Our Reference	UNITS	250171-1
Your Reference		QC02
Date Sampled		15/09/2020
Type of sample		Soil
Date digested	-	17/09/2020
Date analysed	-	17/09/2020
Arsenic	mg/kg	5
Cadmium	mg/kg	<0.4
Chromium	mg/kg	20
Copper	mg/kg	17
Lead	mg/kg	42
Mercury	mg/kg	<0.1
Nickel	mg/kg	8
Zinc	mg/kg	43

Moisture		
Our Reference	UNITS	250171-1
Your Reference		QC02
Date Sampled		15/09/2020
Type of sample		Soil
Date prepared	-	16/09/2020
Date analysed	-	17/09/2020
Moisture	%	9.0

Method ID	Methodology Summary
INORG-008	Moisture content determined by heating at 105 deg C for a minimum of 12 hours.
METALS-020	Determination of various metals by ICP-AES.
METALS-021	Determination of Mercury by Cold Vapour AAS.
Org-020	For urine samples total Mercury is determined, however, mercury in urine is almost entirely in the inorganic form (CDC). Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/MBTEXN in soil						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			16/09/2020	[NT]	[NT]	[NT]	[NT]	16/09/2020	[NT]
Date analysed	-			17/09/2020	[NT]	[NT]	[NT]	[NT]	17/09/2020	[NT]
TRH C ₆ - C ₉	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	87	[NT]
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	87	[NT]
MTBE	mg/kg	0.5	Org-023	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	[NT]	[NT]	[NT]	[NT]	93	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	[NT]	[NT]	[NT]	[NT]	86	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	86	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	84	[NT]
o-xylene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Naphthalene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	66	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: svTRH(C10-C36) in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			16/09/2020	1	16/09/2020	16/09/2020		16/09/2020	[NT]
Date analysed	-			17/09/2020	1	17/09/2020	17/09/2020		17/09/2020	[NT]
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	<50	1	<50	<50	0	87	[NT]
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	<100	1	<100	<100	0	98	[NT]
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	<100	1	<100	<100	0	84	[NT]
TRH >C ₁₀ - C ₁₆	mg/kg	50	Org-020	<50	1	<50	<50	0	94	[NT]
TRH >C ₁₆ - C ₃₄	mg/kg	100	Org-020	<100	1	<100	<100	0	94	[NT]
TRH >C ₃₄ - C ₄₀	mg/kg	100	Org-020	<100	1	<100	<100	0	82	[NT]
Surrogate o-Terphenyl	%		Org-020	94	1	91	93	2	93	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	250171-1
Date digested	-			17/09/2020	1	17/09/2020	17/09/2020		17/09/2020	17/09/2020
Date analysed	-			17/09/2020	1	17/09/2020	17/09/2020		17/09/2020	17/09/2020
Arsenic	mg/kg	2	METALS-020	<2	1	5	4	22	97	93
Cadmium	mg/kg	0.4	METALS-020	<0.4	1	<0.4	<0.4	0	98	92
Chromium	mg/kg	1	METALS-020	<1	1	20	18	11	103	108
Copper	mg/kg	1	METALS-020	<1	1	17	19	11	105	107
Lead	mg/kg	1	METALS-020	<1	1	42	30	33	103	97
Mercury	mg/kg	0.1	METALS-021	<0.1	1	<0.1	<0.1	0	100	94
Nickel	mg/kg	1	METALS-020	<1	1	8	6	29	108	99
Zinc	mg/kg	1	METALS-020	<1	1	43	32	29	103	91

Client Reference: 59422 - Workshops Ave DSI

QUALITY CONTROL: Moisture						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			16/09/2020	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Date analysed	-			17/09/2020	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Moisture	%	0.1	INORG-008	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

Result Definitions	
NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.



Chain of Custody

PROJECT NO.: 59622				LABORATORY BATCH NO.: pm			
PROJECT NAME: Workshop Ave DSI				SAMPLERS: pm			
DATE NEEDED BY: Standard TAT				QC LEVEL: NEPM (2013)			
PHONE: Sydney 02 8245 0300 Perth 08 9488 0100 Brisbane 07 3211 5350 Melbourne 03 9642 0599 Adelaide 08 8431 7113							
SEND REPORT & INVOICE TO: (1) admin@jbsg.com.au; (2) admin@jbsg.com.au; (3) admin@jbsg.com.au							
COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:							
SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	NOTES:	
1 Q602	S	15/9/20		1 x jar		8 metals = As, Cd, Cr, Cu, Ni, Pb, Zn, Hg TRH/BTEXN plus FI, F2 - NEPM	
<div><p>Job No: 250171 Date Recd: 15-9 Time Recd: 1700 Ready: MC Temp: 11/213 8/5 Cooling: 100 pack / None Security: 100 / 100</p></div>						TYPE OF ASBESTOS ANALYSIS	IDENTIFICATION
						NEPM/WA	
METHOD OF SHIPMENT:						RECEIVED BY:	
NAME:						NAME: MC	
DATE:						DATE: 15-9-20	
TRANSPORT CO.						OF: MR	
NAME:						NAME:	
DATE:						DATE:	
TRANSPORT CO.						OF:	
Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Presvd.; C = Sodium Hydroxide Presvd.; VC = Hydrochloric Acid Presvd Vial; VS = Sulfuric Acid Presvd Vial; S = Sulfuric Acid Presvd; Z = Zinc Presvd; E = EDTA Presvd; ST = Sterile Bottle; O = Other						FOR RECEIVING LAB USE ONLY:	
COOLER SEAL - Yes..... No..... Intact..... Broken.....						COOLER SEAL - Yes..... No..... Intact..... Broken.....	
COOLER TEMP deg C						COOLER TEMP deg C	
COOLER SEAL - Yes..... No..... Intact..... Broken.....						COOLER SEAL - Yes..... No..... Intact..... Broken.....	
COOLER TEMP deg C						COOLER TEMP deg C	



DATA QUALITY ASSESSMENT SUMMARY

Report Details

Envirolab Report Reference	<u>250171</u>
Client ID	Strategen - JBS&G
Project Reference	59422 - Workshops Ave DSI
Date Issued	21/09/2020

QC DATA

All laboratory QC data was within the Envirolab Group's specifications.

HOLDING TIME COMPLIANCE EVALUATION

All preservation / holding times (based on AS/ASPHA/ISO/NEPM/USEPA reference documents and standards) are compliant.

Certain analyses have had their recommended technical holding times elongated by filtering and/or freezing on receipt at the laboratory (e.g. BOD, chlorophyll/Pheophytin, nutrients and acid sulphate soil tests).

COMPLIANCE TO QC FREQUENCY (NEPM)

Internal laboratory QC rate complies with NEPM requirements (LCS/MB/MS 1 in 20, Duplicates 1 in 10 samples). Note, samples are batched together with other sample consignments in order to assign QC sample frequency.

QC Evaluation

Duplicate(s) was performed as per NEPM frequency	✓
Laboratory Control Sample(s) were analysed with the samples received	✓
A Method Blank was performed with the samples received	✓
Matrix spike(s) was performed as per NEPM frequency (Not Applicable for Air samples)	✓

Refer to Certificate of Analysis for all Quality Control data.

Appendix 6: Aurora Environmental Management Plan – Western Paddock



**WESTERN PADDOCK
ENVIRONMENTAL MANAGEMENT
PLAN WAPS AREA B
CLAYTON PRECINCT
FORMER MIDLAND RAILWAY
WORKSHOPS, MIDLAND**

Prepared For:	Metropolitan Redevelopment Authority GPO Building Level 1 3 Forest Place PERTH WA 6000
Report Number:	AP2015-129
Report Version:	V1
Report Date:	25 June 2015

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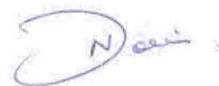
Aurora Environmental has implemented a comprehensive range of quality control measures on all aspects of the company's operation.

An internal quality review process has been applied to each project task undertaken by us. Each document is carefully reviewed and signed off by senior members of the consultancy team prior to issue to the client.

Document No: MRA2012-006-WESP_107_nd_V1

Report No: AP2015-129

Author: Noel Davies
Director



25 June 2015

Signature

Date

DISTRIBUTION

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1	MRA2012-006-WESP_107_nd_V0.1	Draft	19 June 2015	Jeremy Hogben – (Appointed Contaminated Sites Auditor)	ND
1	MRA2012-006-WESP_107_nd_V0.1	Draft	19 June 2015	Aurora Environmental	ND
1	MRA2012-006-WESP_107_nd_V1	V1	25 June 2015	Department of Environment Regulation	ND
1	MRA2012-006-WESP_107_nd_V1	V1	25 June 2015	Metropolitan Redevelopment Authority	ND
1	MRA2012-006-WESP_107_nd_V1	V1	25 June 2015	Jeremy Hogben – (Appointed Contaminated Sites Auditor)	ND
1	MRA2012-006-WESP_107_nd_V1	V1	25 June 2015	Aurora Environmental	ND

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TABLES IN TEXT

A.	Table A	PM10 Monitoring Management Response Summary
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ATTACHMENTS

LIST OF APPENDICES

1. Appendix 1 Development Approval
2. Appendix 2 Environmental Specification
3. Appendix 3 Contractor Health Safety and Environment Management Plan
4. Appendix 4 Contractor Traffic Management Plan
5. Appendix 5 Contractor Emergency Response Plan
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8. Appendix 8 Atmospheric Monitoring Locations

1 INTRODUCTION

1.1 PURPOSE

This EMP has been prepared by Aurora Environmental on behalf of the MRA to satisfy condition 4 of the Development Approval MRA-4660. A copy of the Statement is provide as Appendix 1. Condition 4 and the relevant explanatory note are reproduced below:

4. *An Environmental Management plan is to be submitted at Working Drawings Stage to the satisfaction of the Authority in consultation with the Department of Environmental Regulation. (Refer Advice Note d).*

Advice Note d)

With regard to Condition 4, the Environmental Management Plan is to ensure that risk associated with eh the contamination are appropriately managed during the proposed works. The Environmental Management plan should be developed in consultation with an accredited Contaminated Sites Auditor and on completion of the proposed works, a mandatory Auditors Report prepared and submitted to the Department of Environmental Regulation d)

1.2 BACKGROUND

Works will be undertaken in the Western Paddock soil storage area (the Site) located in the Clayton Precinct of the WAPS BCD Sector of the former Midland Railway Workshops Site. Low level contaminated soils (known as waste fill) containing heavy metals and some asbestos was excavated from some areas of the Workshops site and placed in a storage dump located on the eastern side of the MRA landholdings. The approval allowed the placement of waste fill to a height of 18 m AHD with a cover of 1 metre of clean soil. In agreement with the WA Police Services, it was agreed that these landforms would be shaped to a configuration suitable as horse training paddocks and then capped with topsoil and grassed. The Environmental Approval granted was described in Ministerial Statement 612. Subsequently additional low level waste fill material was placed on the Western Paddock as temporary measure with the agreement of the Office of the EPA as the WA Police Services determined it no longer required the Western Paddock as a horse training area. This resulted in the topsoil and grassing of the paddock not proceeding. The EPA indicated that it regarded the incomplete nature of the Western Paddock formation as a non-compliance with Ministerial Statement 612 and requested that MRA remove the excess waste material and cap the stored waste fill with 1 metre of clean soil as specified in the original approval.

The two specific areas of the non-compliance are:

1. The overall height of the Western Paddock exceeds the approved height of 19m AHD including clean fill capping of 1 m; and
2. The waste fill was not capped with 1 m of clean fill as required.

MRA committed to investigate the best approach for achieving compliance in a cost efficient way and investigated a number of approaches. When it became apparent in order to achieve strict compliance with the terms of the ministerial approval, almost 30,000 m3 of waste fill material would need to be directed off-site for disposal at a total cost in excess of \$10 million, MRA met with representatives of Department of Environmental Regulation seeking approval to reduce the capping thickness to 0.5 m of clean fill. The DER representatives indicated that they had no concerns with such an approach

providing that the appropriate management controls were in place and also suggested that they would be willing to support the retention of the excess waste fill material above 18 m AHD and further reduced capping thickness with appropriate management controls.

Aurora subsequently prepared a risk assessment document which was endorsed the by the appointed Contaminated Sites Auditor. A full description of the works is provided in the Western Paddock Risk Assessment (Aurora 2015).

2 PROJECT DESCRIPTION

The fill in the Western paddock is contaminated with low levels of heavy metals, asbestos containing materials and asbestos fibres in the form of friable asbestos. The purpose of the work program is to ensure that these materials are contained in a landform that will prevent the metals and asbestos from entering the atmosphere as particulates.

The work will comprise the following activities:

- The existing vegetation cover is to be removed and the soils grubbed to remove root matter.
- A bulk earthworks program will be completed to reconfigure the stockpile contours as depicted in Figure 3 of the report titled Western Paddock Risk Assessment (Aurora 2015).
- On completion of the earthworks, the surface of the stockpile will be covered with a minimum of 300 mm of clean fill.
- The surface of the clean fill will then be stabilised with mulch and vegetation to prevent erosion by wind and/or stormwater they will not be subject to erosion.
- The MRA will monitor the vegetated cap for a period of 12-24 months following completion of the works for signs of erosion and will reinstate areas where the capping thickness shows signs of depletion with clean fill.

The following are the key environmental matters requiring the attention of the contractor when implementing the environmental specification:

- Dust control: Is the most critical issue in view of the presence of metals and asbestos in the soil. This applies through all stages of the work program but will be particularly important during vegetation stripping and re-contouring;
- The integrity of the capping system is vital to the long term integrity of the Western Paddock. Works must be implemented in a way that ensure that the capping is constructed as a stable landform.
- It is important to achieve the maximum success with growing a viable vegetation cover as the aim is to achieve a stable long term cap that can be sustained without active management.
- Noise and vibration;
- Control of surface runoff;
- Public and worker safety, including site security.

3 RISK ASSESSMENT

Aurora has completed a qualitative risk assessment for the proposed works and identified the key environmental risk for project that requires management to be:

3.1 DUST AND ASBESTOS FIBRE EMISSIONS

The use of excavation machinery and trucks during the earthworks program has the potential for generating air emissions in the form of particulate dust and asbestos fibres. Due to the close proximity of sensitive land uses, including the WA Police Services CADCOM facility, retail shops and the Austral brickworks facility the issue of dust generation and its management is considered to be of primary importance, particularly due to the presence of asbestos and ACM.

3.2 NOISE AND VIBRATION

The use of excavation machinery and trucks during the remediation program also has the potential for generating noise and vibration impacts. Noise is considered to be a significant issue given the proximity of the development site to sensitive land uses.

The Contractor will be required to comply with the *Environmental Protection (Noise) Regulations 1997* at all times. In order to ensure compliance and to minimise the impact on adjacent land users, the following management measures will be implemented:

- All equipment will be in good working order with effective silencers.
- Occupational noise exposure will be in compliance with WorkSafe WA requirements.

The Contractor will liaise with appropriate stakeholders and the local council prior to the commencement of work to determine suitable operating (start and finish) times and ensure compliance with regulations and limits.

In order to manage impacts due to vibrations, all Contractors will be required to comply with the requirements of Australian Standard *AS2670.2 Evaluation of Human Exposure to Whole Body Vibration*.

3.3 STORMWATER MANAGEMENT

The occurrence of rainfall or the use of water sprays during the remediation program has the potential to generate contaminated surface runoff as a result of contact with contaminated soil.

Remediation of the site shall generally be managed to prevent or minimise stormwater runoff from entering areas of exposed contaminated soil by maintaining a perimeter drain(s) around all excavations. Effort will be made to ensure that contaminants from remediation activities do not enter the drains, so that the perimeter drain(s) will be directed to sewer.

If the situation is deemed necessary earth bunds shall be constructed around areas of known contamination to prevent surface water flows into or out of contaminated areas.

3.4 WASTE MANAGEMENT

The aim of the project is to retain the majority of the stockpiled material on the site. The only material to be directed off-site will a small quantity of organic rich top soil that is regarded as geotechnically unsuitable to sustain the clean fill cap and any identified friable asbestos material such as asbestos blankets (Note this material should have been removed prior to placement but a precautionary

approach has been adopted and the contractor is required to address the possibility of such material being found in the site management plans).

Where topsoil material is to be taken off-site it will need to be treated as if it contains low level asbestos contamination and be assessed for the concentration of metals to determine a suitable class of landfill.

4 ENVIRONMENTAL MANAGEMENT

In order to address the environmental risks identified in Section 3, the appointed contractor was required to prepare a number of management plans for approval by the Metropolitan Redevelopment Authority. The following plans have been developed and approved by MRA on advice from the supporting consulting team including Aurora Environmental:

- A Health Safety and Environmental Management Plan
- A Traffic Management Plan
- An Emergency Response Plan
- A Stormwater Management Plan

The scope of these plans was defined in the environmental specification that accompanied the Request for Tender issued by the MRA. A copy of this specification is included as Appendix 2.

Copies of these approved plans are include as Appendices 3 - 6 respectively.

A copy of the Contractor Construction Management Plan is provided as Appendix 7 as this provides contextual information on the approaches adopted for the work and also provides further detail on erosion and dust management controls as required in the Environmental Specification and Condition 3 of the Development Approval.

In addition to the measures described in these plans, the MRA has commissioned surveillance monitoring of dust and asbestos levels in three locations to ensure that dust asbestos fibres are controlled effectively.

4.1 ENVIRONMENTAL MONITORING

In view of the critical risk represented by dust emission from the site, Aurora recommended to MRA that it implement a comprehensive air monitoring program for PM₁₀ and Airborne asbestos fibres. The scope and approach the air monitoring program is described below.

Monitoring of PM₁₀ particulates and airborne asbestos fibre monitoring will be undertaken by MRA's environmental consultant for the duration of the contract.

4.1.1 PM₁₀ Particulate Monitoring

Real time data gathered from three (3) PM₁₀ continuous dust monitors (Dustrak or equivalent) monitoring will be used to ensure that the dust management practices implemented by the contractor comply with relevant guidelines. It is noted that the Dustrak type monitors do measure PM₁₀ concentrations to the accuracies required for ongoing air quality monitoring programs, but hey provide satisfactory quantitative measure of particulate concentrations for the purpose of surveillance monitoring and are a substantial improvement over visual dust monitoring. The dust monitors will be programmed to generate alerts and alarms via SMS messages to the Contractor's site supervisor and the environmental superintendent. The monitors will be sited in the following general locations:

- Adjacent to the WA Police Services CADCOM Facility:
- Adjacent to the retail shopping facilities north of Coppershop Road
- In an area to the South- east adjacent to the Austral Brickworks Site

The locations of the monitoring sites are depicted in a plan attached as Appendix 8.

The following target PM₁₀ concentration criteria have been adopted:

- 24 hour PM₁₀ concentration of 50 ug/m³ not to be exceeded.
- 1 hour PM₁₀ concentration of 1000 ug/m³ not to be exceeded.

The 24 hour criteria is adopted from the National Environmental Protection (Ambient Air Quality) Measure objective for PM₁₀ concentrations in urban environments of 50 ug/m³ not to be exceeded more than 5 times in a year.

There are not statutory criteria for 1 hour average PM₁₀ concentrations but the logic for the 1 hour average is that a single 1 hour result of 1000 ug/m³ with all other hours being 0 would result in a 24 hour average PM₁₀ concentration of 41.67 ug/m³ (A single hour with 1200 ug/m³ would result in a 24 hour average concentration of 50 ug/m³ even if the PM₁₀ concentration for all other hours were zero ug/m³).

Table A describes the management responses proposed to exceedances of the adopted criteria. To minimise the possibility that the adopted assessment criteria will be exceeded, two sets of alarm levels and responses will be implemented as described in the table below. The Corrective Action Alert levels have been set at 80% of the adopted Alarm criteria with the aim that action will be taken to prevent and exceedance of the Alarm level.

TABLE A - PM₁₀ MONITORING MANAGEMENT RESPONSE SUMMARY

Alarm Type	Trigger Value (ug/m3)	Management Response
1 hour average Corrective Action Alert (Indicative of a short period of elevated dust emissions that if allowed to persist may result in exceedances of the statutory particulate criteria)	800	<ul style="list-style-type: none"> • Notification sent to the Contractor's site supervisor's mobile phone. • Site supervisor to immediately evaluate conditions and implement contingency measures as specified in the agreed Dust Management Plan.
24 hour average Corrective Action Alert. (Indicative of prolonged periods of dust emission that may result in exceedances of the statutory particulate criteria)	40	<ul style="list-style-type: none"> • Alarm notification sent to Contractor's site supervisor's mobile phone • Site supervisor to immediately evaluate conditions and implement contingency measures.
1 hour average Alarm (Indicative of a short period of elevated dust emissions that if allowed to persist will almost certainly result in exceedances of the statutory particulate criteria)	1000	<ul style="list-style-type: none"> • In addition to SMS alarm to the site supervisor, SMS is also sent to the site environmental superintendent who will require immediate action to control dust or cessation of work. • If condition persists for more than 3 hours, then work to cease on site.
24 hour average Alarm (Indicative of prolonged periods of dust emission that will almost certainly result in exceedances of the statutory particulate criteria)	50	<ul style="list-style-type: none"> • In addition to SMS alarm to the Contractor's site supervisor, SMS is also sent to the environmental superintendent who will require immediate action to control dust or cessation of work. • Dust controls for the site to be re-evaluated and upgraded as required to prevent a recurrence.

The results of monitoring and the management responses will be reported in the closeout report for the site for the works.

4.1.2 Ambient Asbestos Fibre Monitoring

Asbestos monitors will be deployed in 3 locations (adjacent to the PM₁₀ monitors) during periods when the site is being actively worked. The results of asbestos monitoring will be determined overnight and provided to the contractor by email.

In the event that monitoring detects airborne asbestos fibres at concentrations in excess of 0.01 fibres/ml. The environmental superintendent will contact the contractor and require a review of dust control practices. If monitoring detects airborne asbestos fibres at concentrations in excess of 0.02 fibres/ml the Contractor will be required to cease works until more stringent dust control measures are implemented.

5 REFERENCES

National Environment Protection Council (NEPC) (2004) National Environment Protection (Air Toxics) Measure. National Environment Protection Council Service Corporation, Adelaide. December 2004.

APPENDIX 1

Development Approval

APPENDIX 2

Environmental Specification

MIDLAND RAILWAY WORKSHOPS - WESTERN PADDOCK ENVIRONMENTAL SPECIFICATIONS

OVERVIEW

Aurora Environmental has prepared this specification in relation to a program of earthworks to recontour and cap the Western Paddock to ensure that asbestos and heavy metals are contained for the long term.

The works to be undertaken are described in the engineering and Landscape Specifications for the works.

The key elements of the work program are detailed in the RFT and Civil works specification:

The fill in the Western paddock is contaminated with low levels of heavy metals, asbestos containing materials and asbestos fibres in the form of friable asbestos. The purpose of the work program is to ensure that these materials are contained in a landform that will prevent the metals and asbestos from entering the atmosphere as particulates.

The following are the key environmental matters requiring the attention of the contractor when implementing the environmental specification:

- Dust control is critical in view of the presence of asbestos in the soil. This applies through all stages of the work program but is critical during vegetation stripping and re-contouring;
- The integrity of the capping system is vital to the long term integrity of the Western Paddock. Works must be implemented in a way that ensure that the capping is constructed as a stable landform.
- It is important to achieve the maximum success with growing a viable vegetation cover as the aim is to achieve a stable long term cap that can be sustained without active management.
- Noise and vibration;
- Control of surface runoff;
- Public and worker safety, including site security.

Properties of the Soil

The soil in the Western Paddock consists of waste fill excavated from the Midland Railway Workshops Site during remedial works. It is a mixture of sand, clay, ash and cinders and is contaminated with low levels of heavy metals, Asbestos Containing Materials (ACM) and friable asbestos. The concentrations of the contaminants are summarised in the tables in Attachment 1.

MANAGEMENT OF CONTAMINATED SOIL

The soil in the Western Paddock has generally been characterised through sampling as being suitable for disposal as Class 1 Special Waste (Asbestos). The Engineering specification indicates that all soil is to be retained on site and covered with a clean fill cap.

If for any reason the soils from the paddock must be removed, the contractor will need to stockpile the soil separately and advise MRA's environmental superintendent to arrange for the fill to be sampled in accordance with the DER Publication - Landfill Waste Classification and Waste Definitions 1996 (As amended December 2009). The environmental superintendent will advise on the correct landfill classification within 10 working days (The maximum period required to receive the necessary concentration and ASLP leaching data from laboratory sampling). A temporary bunded pad (say black builders plastic on a 150 mm thickness of compacted limestone) will be required where contaminated soil is stockpiled in an area that is free of contamination (e.g. on an area of completed clean fill cap or an area outside the footprint of the raised Western Paddock).

The contractor may then arrange transport and disposal of the waste to an appropriate landfill.

AIR EMISSIONS

The use of excavation machinery and trucks during the earthworks program has the potential for generating air emissions in the form of particulate dust and asbestos fibres. Due to the close proximity of sensitive land uses, including the WA Police Services CADCOM facility, retail shops and the Austral brickworks facility the issue of dust generation and its management is considered to be of primary importance, particularly due to the presence of asbestos and ACM.

The Contractor will as a minimum be required to comply with the Department of Environmental Regulation guideline document 'A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities (2011). As indicated in the RFT, the successful Contractor will be required to submit and have approved a Dust Management plan prior to commencement of site works. The Dust Management Plan should recognise the following:

- Advisory notices will be issued by the MRA to adjoining land occupiers and the City of Swan) before site works commence. The notices shall include the name of the Contractor and Superintendent's Representative.
- The Contractor shall be responsible for maintaining strict control over works with dust-creating potential. The Contractor's Site Supervisor shall conduct regular inspections of the works (several times each day) to assess the effectiveness of dust control measures. Where the nature of the works or weather conditions are conducive to dust formation, additional dust control measures should be implemented.

It should be noted that dust and airborne asbestos fibre monitoring will be undertaken by the Environmental Superintendent for the duration of the contract.

Real time data gathered from three (3) PM10 continuous dust monitors monitoring will be used to ensure that the dust management practices implemented comply with relevant guidelines. The dust monitors will be programmed to generate alerts and alarms via SMS messages to the Contractors site supervisor and the environmental superintendent. The monitors will be sited in the following general locations:

- Adjacent to the WA Police Services CADCOM Facility:
- Adjacent to the Retail shopping facilities north of Coppershop Road
- In an area to the South- east adjacent to the Austral Brickworks Site

The precise locations of the monitoring sites are still to be agreed with landowners and will be provided to the successful Contractor prior to the commencement of Works.

Management response to the adopted assessment criteria. To minimise the possibility that the adopted assessment criteria will be exceeded, two sets of alarm levels and responses will be implemented as described in the table below. The Corrective Action Alert levels have been set at 80% of the adopted Alarm criteria with the aim that action will be taken to prevent and exceedance of the Alarm level

Alarm Type	Trigger Value	Management Response
1 hour average Corrective Action Alert (Indicative of a short period of elevated dust emissions that if allowed to persist may result in exceedances of the statutory particulate criteria)	800	<ul style="list-style-type: none"> • Notification sent to the Contractor's site supervisor's mobile phone • Site supervisor to immediately evaluate conditions and implement contingency measures as specified in the agreed Dust Management Plan
24 hour average Corrective Action Alert. (Indicative of prolonged periods of dust emission that may result in exceedances of the statutory particulate criteria)	40	<ul style="list-style-type: none"> • Alarm notification sent to Contractor's site supervisor's mobile phone • Site supervisor to immediately evaluate conditions and implement contingency measures
1 hour average Alarm (Indicative of a short period of elevated dust emissions that if allowed to persist will almost certainly result in exceedances of the statutory particulate criteria)	1000	<ul style="list-style-type: none"> • In addition to SMS alarm to the site supervisor, SMS is also sent to the site environmental superintendent who will require immediate action to control dust or cessation of work. • If condition persists for more than 3 hours, then work to cease on site
24 hour average Alarm (Indicative of prolonged periods of dust emission that will almost certainly result in exceedances of the statutory particulate criteria)	50	<ul style="list-style-type: none"> • In addition to SMS alarm to the Contractor's site supervisor, SMS is also sent to the environmental superintendent who will require immediate action to control dust or cessation of work. • Dust controls for the site to be re-evaluated and upgraded as required to prevent a recurrence

- Asbestos monitors will be deployed in 4 locations during periods when the site is being actively worked. The results of asbestos monitoring will be determined overnight and provided to the Contractor by email.
- In the event that monitoring detects airborne asbestos fibres at concentrations in excess of 0.01 fibres/ml. The environmental superintendent will contact the contractor and require a review of dust control practices. If monitoring detects airborne asbestos fibres at concentrations in excess of 0.02 fibres/ml the Contractor will be required to cease works until more stringent dust control measures are implemented
- The results of the monitoring will be made available to the Contractor to assist in managing dust issues at the site.
- A water truck shall be available for the duration of the site works, particularly during vegetation stripping and bulk earthworks operations.
- Water sprays will be used to minimise dust emissions in dry or windy conditions.
- Roads servicing the site will be wetted down where necessary and fine water sprays will be employed to minimise dust.
- Wind fencing will be placed around the site perimeter and/or edge of the site. The wind fencing will remain in place for the duration of the project or at the discretion of the Superintendent's Representative.
- In dry weather conditions, surface stabilisation agents should be used as required on disturbed or bare areas of soil.
- All machinery used should be thoroughly decontaminated with high-pressure water sprays or equivalent in a designated wash down area prior to leaving the site to prevent the spread of contaminated material. Any residual material captured from cleaning the machinery during wash down will be disposed of appropriately.
- Any complaint from a member of the public about dust or other air emissions from the site shall managed in accordance with and agreed complaint management protocol as specified in the Contractor's approved Dust Management Plan.
- Where the Superintendent's Representative or Environmental Superintendent determines that unacceptable air emissions are being generated, work will cease immediately until the source of the emissions is contained. Any costs associated due to a delay of works caused by inadequate control of dust will be borne by the contractor

NOISE & VIBRATION

The use of excavation machinery and trucks during the remediation program also has the potential for generating noise and vibration impacts. Noise is considered to be a significant issue given the proximity of the development site to sensitive land uses.

The Contractor will be required to comply with the *Environmental Protection (Noise) Regulations 1997* at all times. In order to ensure compliance and to minimise the impact on adjacent land users, the following management measures will be implemented:

- All equipment will be in good working order with effective silencers.
- Occupational noise exposure will be in compliance with WorkSafe WA requirements.

The Contractor will liaise with appropriate stakeholders and the local council prior to the commencement of work to determine suitable operating (start and finish) times and ensure compliance with regulations and limits.

In order to manage impacts due to vibrations, all Contractors will be required to comply with the requirements of Australian Standard *AS2670.2 Evaluation of Human Exposure to Whole Body Vibration*.

SURFACE RUNOFF

The occurrence of rainfall or the use of water sprays during the remediation program has the potential to generate contaminated surface runoff as a result of contact with contaminated soil.

Remediation of the site shall generally be managed to prevent or minimise stormwater runoff from entering areas of exposed contaminated soil by maintaining a perimeter drain(s) around all excavations. Effort will be made to ensure that contaminants from remediation activities do not enter the drains, so that the perimeter drain(s) will be directed to sewer.

If the situation is deemed necessary earth bunds shall be constructed around areas of known contamination to prevent surface water flows into or out of contaminated areas.

HEALTH, SAFETY AND SITE SECURITY

Public and worker safety is the responsibility of the Contractor. The proposed remedial works will involve the excavation and handling of soil contaminated with low concentrations of heavy metals, ACM and friable asbestos

Implementation of the remediation strategy may involve the following public and worker health and safety risks and hazards:

- Exposure to contaminated materials.
- Operation of heavy machinery.
- Working in or near excavations.
- Working in proximity to underground and above ground services.
- Increased traffic movements, particularly heavy vehicles.
- Unauthorised access by the public during and out of work hours.

The Contractor will be required to develop and implement an Occupational Health and Safety Plan (OHSP) in accordance with WorkSafe WA requirements. A copy of this plan must be lodged with the Superintendent prior to commencement of works onsite.

The following measures to prevent or minimise risks to the public shall be considered in the OHSP:

- Adequate signage at regular intervals along the site boundaries warning the public to keep out of the site by advising the danger of the site operations and the presence of contaminated material.
- Security of the site will be achieved by maintaining the perimeter fence with controlled access during working hours. All gates to the site will be locked outside of working hours.
- The Contractor shall provide for security after work hours to prevent unauthorised access to the site.
- Airborne emissions will be controlled as described in the Air Emissions Section.
- Any visitors to the site will be required to wear the appropriate PPE as designated in the Contractor’s Occupational Health and Safety Plan.

ENVIRONMENTAL SUPERVISION

Remedial works are to be undertaken in accordance with the requirements of this document and other specifications attached with the Request for Tender. To ensure that this occurs, remediation of the site will be performed under the guidance of an Environmental Superintendent.

The Environmental Superintendent will be a representative of the Client and is independent of the Contractor responsible for the undertaking the remedial works. The Environmental Superintendent will be on site regularly and contactable at all times during the remediation period. This person(s) will also have the authority to direct works, including any necessary stoppages for environmental reasons, as and when the situation requires.

The Environmental Superintendent may also liaise with the Superintendent’s Representative and/or client regarding conformance with environmental requirements.

GLOSSARY

Environmental Superintendent	Aurora Environmental or qualified persons/company directed by Aurora Environmental to undertake duties on site.
Contractor	The site contractor and its subcontractors commissioned to undertake any and all demolition and remedial works at the Hollywood SHS site.

Attachment 1
Soil Contamination Characteristics

TABLE 1: WESTERN PADDOCK STOCKPILE - UPPER TIER
TABULATED RESULTS (TOTAL METALS, LEACHABLE METALS, TPHS AND ASBESTOS)

	Metals											Leachable Metals					Total Petroleum Hydrocarbons								
	Arsenic	Barium	Cadmium	Chromium	Copper	Mercury	Manganese	Molybdenum	Nickel	Lead	Zinc	pH	Arsenic	Cadmium	Chromium	Molybdenum	Nickel	Lead	Mercury	C ₆₋₉	C ₁₀₋₁₄	C ₁₅₋₂₈	C ₂₉₋₃₆	Total TPH	Asbestos
CRITERIA						mg/kg																			
CL1	500	50000	100	500(h)	50000	75	50000	1000	3000	1500	50000	NV	NV	NV	NV	NV	NV	NV	NV	2800	NV	NV	NV	NV	mal/kg
ASLP	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	0.5	0.1	0.5	0.5	0.2	0.5	0.01	NV	NV	NV	NV	NV	NV
EIL	20	400	3	50(f)	60	1	500	40	60	300	200	NV	NV	NV	NV	NV	NV	NV	NV	100	500	1000	NV	NV	NV
HIL A	100	5370	20	210(f)	1000	15	1500	390	600	300	7000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
SPUT 1	<2	16	0.9	10	4	0.15	11	<1	3	24	8	6.85	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 2	7	62	1.6	17	40	0.14	190	<1	9	88	67	7	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	Chrys
SPUT 3	9	120	2.3	22	1200	0.3	170	<1	30	640	460	7.5	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	Chrys
SPUT 4	11	180	2	22	820	0.3	190	<1	34	2300	740	7.65	<0.05	<0.001	<0.001	0.006	<0.005	<0.01	0.0001	<10	<10	<10	<10	<20	Chrys
SPUT 5	7	110	5.2	75	110	0.36	300	1	33	300	300	7.7	<0.05	<0.001	0.002	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 6	<2	93	2	25	44	0.28	350	<1	12	140	56	8	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 7	<2	120	2.9	34	62	0.2	89	<1	15	190	90	7.9	<0.05	<0.001	0.002	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 8	3	67	2	28	490	0.27	92	<1	15	230	89	7.75	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 9	3	60	1.9	28	48	0.16	66	<1	13	130	60	7.75	<0.05	<0.001	0.002	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 10	4	66	1.2	17	51	0.19	64	<1	7	180	81	7.95	<0.05	<0.001	0.003	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 11	5	77	1.7	22	71	0.29	110	<1	10	180	83	7.95	<0.05	<0.001	0.001	<0.005	<0.005	<0.01	0.0001	<10	<10	<10	<10	<20	NAD
SPUT 12	3	80	1.5	21	83	0.63	79	<1	7	440	95	8.15	<0.05	<0.001	<0.001	<0.005	<0.005	0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 13	<2	38	1.5	28	36	0.15	42	<1	6	69	32	8.25	<0.05	<0.001	0.002	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 14	7	71	3.2	20	83	0.59	160	<1	18	150	300	8.1	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	0.0001	<10	<10	<10	<10	<20	NAD
SPUT 15	3	63	2.6	41	42	0.19	100	<1	15	110	82	7.95	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 16	5	170	1.7	21	280	0.34	190	<1	33	190	150	7.25	<0.05	<0.001	0.006	<0.005	0.005	0.01	0.0001	<10	<10	<10	<10	<20	NAD
SPUT 17	8	74	2.9	47	87	0.35	140	<1	15	470	110	7.5	<0.05	<0.001	0.002	<0.005	<0.005	<0.01	0.0001	<10	<10	<10	<10	<20	NAD
SPUT 18	13	140	4.5	55	150	0.39	410	<1	35	380	360	8.25	<0.05	<0.001	0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 19	<2	100	2.5	110	130	0.39	230	<1	24	310	200	7.7	<0.05	<0.001	0.002	<0.005	<0.005	0.02	0.0001	<10	<10	<10	<10	<20	NAD
SPUT 20	<2	67	2.1	36	130	0.33	120	<1	16	210	140	7.45	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 21	6	63	3	45	59	0.4	170	<1	15	170	130	7.95	<0.05	<0.001	0.002	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 22	<2	67	1.7	44	120	1.1	93	<1	8	140	130	8.45	<0.05	<0.001	0.003	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	Ames
SPUT 23	4	57	1.9	72	180	0.26	100	<1	13	130	81	7.75	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 24	3	37	1.6	19	24	0.89	53	<1	5	270	37	8	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 25	5	43	1.4	17	50	0.18	48	<1	9	74	52	7.05	<0.05	<0.001	0.007	<0.005	0.006	0.02	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 26	<2	29	0.8	12	21	0.14	39	<1	6	34	31	7.75	<0.05	<0.001	0.003	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	NAD
SPUT 27	6	75	1.9	36	100	0.28	66	<1	15	500	130	8.35	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	0.0001	<10	<10	<10	<10	<20	NAD

**TABLE 1: WESTERN PADDOCK STOCKPILE - UPPER TIER
TABULATED RESULTS (TOTAL METALS, LEACHABLE METALS, TPHS AND ASBESTOS)**

CRITERIA	Metals										Leachable Metals					Total Petroleum Hydrocarbons												
	Arsenic		Cadmium		Chromium		Copper	Mercury	Manganese	Molybdenum	Nickel	Lead	Zinc	pH	Arsenic	Cadmium	Chromium	Molybdenum	Nickel	Lead	Mercury	C ₆₋₉	C ₁₀₋₁₄	C ₁₅₋₂₈	C ₂₉₋₃₆	Total TPH	Asbestos	
	500	50000	100	500(h)	50000	75	50000	1000	3000	1500	50000	NV	NV	NV	NV	mg/l	mg/l	NV	NV	NV	2800	NV	NV	NV	NV	mg/kg		
CL1	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	0.5	0.1	0.5	0.5	0.2	0.5	0.01	NV	NV	NV	NV	NV	NV	
ASLP	20	400	3	50(f)	60	1	500	40	60	300	200	NV	NV	NV	NV	NV	NV	NV	NV	NV	100	500	1000	NV	NV	NV	NV	
EIL	100	5370	20	210(f)	1000	15	1500	390	600	300	7000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	
HIL A	21	270	7.5	130	5200	0.31	650	6	120	1200	1100	8	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 28	9	63	1.8	31	110	0.08	150	1	16	180	360	7.7	<0.05	<0.001	0.003	0.005	<0.005	<0.005	0.02	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 29	8	210	3.5	44	880	0.59	300	<1	45	970	450	7.65	<0.05	<0.001	<0.001	0.006	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 30	4	74	2.5	40	46	0.21	110	<1	18	130	46	8.1	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 31	<2	70	1.4	31	45	0.12	100	<1	17	150	57	7.95	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 32	<2	140	2.1	40	92	0.15	130	<1	24	300	110	8.05	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 33	<2	81	2	32	64	0.34	98	<1	17	160	72	8.15	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 34	3	97	2.1	49	110	0.23	100	<1	16	210	88	7.95	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 35	6	270	4.7	53	850	0.31	450	<1	63	920	610	8.1	<0.05	<0.001	<0.001	<0.001	0.006	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 36	8	110	1.8	19	440	0.29	100	<1	16	670	200	8.4	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 37	62	310	5.7	45	3000	2.8	560	2	60	1700	1100	8.35	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 38	6	170	3	24	480	0.54	220	<1	28	690	550	8.35	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 39	11	170	2.4	42	510	0.17	230	<1	38	730	450	8.35	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 40	10	130	2.6	33	500	0.3	200	<1	37	590	330	7.55	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 41	10	140	2.3	30	770	0.34	220	<1	37	680	300	8.3	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	0.03	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 42	9	170	1.9	30	170	0.3	140	<1	24	860	210	8.25	<0.05	<0.001	<0.001	<0.001	0.0009	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 43	9	62	1.3	22	100	0.14	84	<1	15	190	110	7.85	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 44	4	36	0.5	7	72	0.07	39	<1	5	130	63	7.95	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 45	7	100	1.4	31	150	0.17	150	<1	18	640	320	8.15	<0.05	<0.001	0.0003	<0.003	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 46	3	79	0.9	12	170	0.16	110	<1	10	360	180	7.45	<0.05	<0.001	0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 47	3	27	0.4	7	43	0.13	39	<1	5	88	63	7.25	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 48	46	480	7.1	130	3500	0.42	1100	10	250	3400	2200	7.05	<0.05	<0.001	<0.001	0.004	0.005	0.016	0.02	<0.0001	<10	<10	<10	<10	<20	<20	Amos	
SPUT 49	30	310	4.3	44	3500	2.1	650	2	93	3200	1300	7.1	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	0.04	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 50	55	280	4	31	2700	5.7	590	<1	55	2200	1000	7.05	<0.05	<0.001	0.002	<0.001	<0.005	<0.005	0.05	<0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 51	50	270	5.7	54	3300	4.1	790	1	72	2200	1100	7.2	<0.05	<0.001	0.001	<0.001	<0.005	<0.005	0.05	<0.0001	<10	<10	<10	<10	<20	<20	Amos	
SPUT 52	52	280	4.4	45	2300	6.8	580	<1	83	2500	950	7.2	<0.05	<0.001	0.001	<0.001	<0.005	<0.005	0.04	0.0001	<10	<10	<10	<10	<20	<20	Chrys	
SPUT 53	10	80	1.4	29	280	1.1	160	<1	26	290	170	7.8	<0.05	<0.001	0.002	<0.001	<0.005	<0.005	0.01	<0.0001	<10	<10	<10	<10	<20	<20	NAD	
SPUT 54	13	130	3.5	58	190	0.47	500	1	40	340	340	8.2	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	0	
Dup 1	18	320	3.5	70	890	0.82	490	1	130	1600	1200	7.3	<0.05	<0.001	0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	0	
Dup 2	18	110	2.1	29	1000	0.12	210	<1	34	570	260	7.75	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	0	
Dup 3	18	110	2.1	29	1000	0.12	210	<1	34	570	260	7.75	<0.05	<0.001	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	<10	<10	<10	<10	<20	<20	0	

**TABLE 1: WESTERN PADDOCK STOCKPILE - UPPER TIER
TABULATED RESULTS (TOTAL METALS, LEACHABLE METALS, TPHS AND ASBESTOS)**

	Metals										Leachable Metals					Total Petroleum Hydrocarbons									
	Arsenic	Cadmium	Chromium	Copper	Mercury	Manganese	Molybdenum	Nickel	Lead	Zinc	pH	Arsenic	Cadmium	Chromium	Molybdenum	Nickel	Lead	Mercury	C ₆₋₉	C ₁₀₋₁₄	C ₁₅₋₂₈	C ₂₉₋₃₆	Total TPH	Asbestos	
CRITERIA					mg/kg									mg/l										mg/kg	
CL1	500	50000	100	500(h)	50000	75	50000	1000	3000	1500	50000	NV	NV	NV	NV	NV	NV	NV	2800	NV	NV	NV	NV	NV	NV
ASLP	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	0.5	0.1	0.5	0.5	0.2	0.5	0.01	NV	NV	NV	NV	NV	
EIL	20	400	3	50(f)	60	1	500	40	60	300	200	NV	NV	NV	NV	NV	NV	NV	100	500	1000	NV	NV	NV	
HIL A	100	5370	20	210(f)	1000	15	1500	390	600	300	7000	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	
STATISTICAL ANALYSIS																									
max	62	480	7.5	130	5200	6.8	1100	10	250	3400	2200	8.45	<0.05	<0.001	0.007	0.006	0.016	0.05	0.0001	<10	<10	<10	<20	<20	0
mean	12.7442	122.667	2.54074	37.2037	627.722	0.68926	217.056	3.28571	30.1852	618.278	325.611	7.79907	<0.05	<0.001	0.00245	0.00482	0.009	0.02538	0.0001	<10	<10	<10	<20	<20	0
std dev	15.6785	92.6053	1.55424	25.715	1137.5	1.30035	218.92	3.45033	38.6543	804.306	419.488	0.42242	<0.05	<0.001	0.0016	0.00198	0.00608	0.01506	1.4E-20	0	0	0	0	0	0
mean+stdv	28.4226	215.272	4.09496	62.9187	1765.23	1.98961	435.975	6.73604	68.8395	1422.58	745.1	8.2215	<0.05	<0.001	0.00405	0.0068	0.01508	0.04045	0.0001	0	0	0	0	0	0
QUALITY CONTROL ANALYSIS																									
SPUT 5	7	110	5.2	75	110	0.36	300	1	33	300	300	7.7	<0.05	<0.001	0.002	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
Dup 1	13	130	3.5	58	190	0.47	500	1	40	340	340	8.2	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
RPD (%)	0.3	0.08333	0.0977	0.06391	0.13333	0.06627	0.125	0	0.04795	0.03125	0.03125	0.01572	0	0	0	0	0	0	0	0	0	0	0	0	0
SPUT 28	21	270	7.5	130	5200	0.31	650	6	120	1200	1100	8	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
Dup 2	18	320	3.5	70	890	0.82	490	1	130	1600	1200	7.3	<0.05	<0.001	0.001	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
RPD (%)	0.07692	0.08475	0.36364	0.3	0.70772	0.45133	0.14035	0.71423	0.04	0.14286	0.04348	0.04575	0	0	0	0	0	0	0	0	0	0	0	0	0
SPUT 40	11	170	2.4	42	510	0.17	230	<1	38	730	450	8.35	<0.05	<0.001	<0.001	<0.005	<0.005	<0.1	0.0001	0	0	0	0	0	0
Dup 3	18	110	2.1	29	1000	0.12	210	<1	34	570	260	7.75	<0.05	<0.001	<0.001	<0.005	<0.005	<0.01	<0.0001	0	0	0	0	0	0
RPD (%)	0.24138	0.21429	0.06667	0.1831	0.3245	0.17241	0.04545	0	0.05556	0.12308	0.26761	0.03727	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

- 500 Value exceeds Class 1 Landfill Waste Classification Criteria (DoE 2005)
- NV Value exceeds Class 1 (leachable Concentration) Landfill Waste Classification Criteria (DoE 2005)
- 20 Value exceeds Ecological Investigation Level (DoE 2003)
- 100 Value exceeds Health Investigation Level 'A' - Standard Residential Setting Landuse Scenario (DoE 2003)
- NAD denotes No Asbestos Detected
- Chrys denotes Chrysotile Asbestos Detected
- Amos denotes Amosite Asbestos Detected
- NV denotes No Value Specified
- ** denotes Not Analysed

APPENDIX 3

Contractor Health Safety and Environment Plan

HEALTH, SAFETY AND ENVIRONMENT

MANAGEMENT PLAN

	Site Details
Client:	Metropolitan Redevelopment Authority (MRA)
Site Name:	Western Paddock Remediation
Project Number:	1552
Project Commencement Date:	TBA
Estimated Project Completion Date:	TBA
Issue Date:	May 2015
Document ID Code:	1552-HSE-MP-001-02

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HSE Management Plan

Western Paddock Remediation



Version	Date	Revision Details	Compiled by	Corporate HSE Representative	Project Manager	PM Line Manager
0	15/05/15	Initial Draft	Bridget White (Health and Safety) Alex Kantor (Environmental)	Name: Paul Dickenson Signature:	Name: Steve Faulkner Signature:	Name: Dene Hyde Signature:
1	29/05/15	Management Team amendments	Bridget White	Name: Paul Dickenson Signature:	Name: Steve Faulkner Signature:	Name: Dene Hyde Signature:
2	05/06/15	Third Party & Client comments added	Bridget White	Name: Paul Dickenson Signature:	Name: Steve Faulkner Signature:	Name: Dene Hyde Signature:
				Name: Signature:	Name: Signature:	Name: Signature:
				Name: Signature:	Name: Signature:	Name: Signature:

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1. INTRODUCTION AND PURPOSE

The purpose of this Management Plan is to describe how health and safety risks and environmental aspects are to be managed so that the site and those engaged onsite will:

- Comply with Georgiou Policy and legal and other obligations;
- Minimise the impacts on the health and safety of workers;
- Minimise the impacts on the environment;
- Achieve the Company, client and site objectives and targets.

This Management Plan is written in accordance with Georgiou's health, safety and environment management system that is 3rd party certified to AS/NZS 4801, AS/NZS ISO 14001 and the Australian Building and Construction Occupational Health and Safety Accreditation Scheme (Federal Safety Commission). The development of this Management Plan has been based upon the risks and opportunities identified and specifically address client, contractual, legal and other obligations.

1.1 Amendments and Authorisation

This Management Plan shall be approved by the Project Manager, their Line Manager and a Representative from the HSE Department.

This Management Plan and other related documents will be reviewed annually or as a result of:

- Changes to Company procedures or processes;
- Changes to key personnel or resources;
- Changes in legal and other obligations;
- Findings from an audit or inspection;
- Findings from a significant incident or near miss;
- Significant changes to site conditions and/or work methods
- Instructions from the Metropolitan Redevelopment Authority or the OSH Committee if established.

Reviews shall be undertaken in consultation with key stakeholders to ensure all work locations and impacts are considered. A record of the date and comments relating to any revisions of this document shall be included in the revision table.

The only Georgiou authorisation required to amend this document after initial approval is the Project Manager's.

1.2 Communication of Plan

The Project Manager is accountable for ensuring:

- Location and access to the management plans will be communicated at induction
- Site communication forums will also be used to communicate specific requirements of the plans
- Any changes made to the Management Plan are communicated to all affected persons on the site

1.3 Supporting Management Plans

The following plans have been developed to support this management plan:

- Emergency Response Plan;
- Georgiou Crisis Management Plan (controlled by Georgiou's Perth Head Office and available on Company Intranet);
- Traffic Management Plan

1.4 Terminology & Definitions

Terms and definitions used within this document are further explained in Georgiou's *Terminology & Definitions Guideline*.

2. SCOPE OF WORKS

This Management Plan has been prepared for the Metropolitan Redevelopment Authority. The scope of works includes the following activities:

- Vegetation stripping
- Topsoil stripping
- Re-grading Stockpile
- Installation of Geogrid
- Clean fill Capping
- Replace vegetation & monitor
- Install access to stockpile for maintenance

Estimated project mobilisation date of 18th May 2015 and estimated completion date of 6th July 2015.

2.1 Environmental Setting

2.1.1 Landform and Climatic Conditions

- Summers are generally hot and dry, lasting from December to late March, with February generally being the hottest month of the year, while winters are relatively mild and wet, making Perth a classic example of a Mediterranean climate. Summer is not completely devoid of rain with sporadic rainfall in the form of short-lived thunderstorms.
- The Project and surrounding area is relatively flat with no significant land forms.
- The site is located off Coppershop Road and is adjacent to a shopping precinct to the north, the Western Australian Police Services site to the west and is approximately 250m south of the Midland Health Campus.

2.1.2 Map of the Project Areas



- The above aerial photograph highlights the site location and the approximate site boundary

3. POLICY, OBJECTIVES AND TARGETS

The following documents provide further information in regards to this topic:

- *Strategies, Objectives and Continuous Improvement Standard*

3.1 Policy

This Management Plan has been prepared in accordance with Georgiou's Health, Safety and Environmental Policies. All relevant works, including those conducted by subcontractors or by other companies on Georgiou's behalf, will conform to this Policy.

Georgiou's Health, Safety and Environment Policies will be communicated to all workers at their site induction and displayed in a prominent location at the site. Georgiou's Policies will be made available to any other interested party and are available on the Georgiou website www.georgiou.com.au.

Georgiou's policies will be reviewed for suitability at least annually, during the Management Review Process and the outcome of the review will be documented. In the event a change to a policy is required, the policy will be revised, authorised by the CEO and changes communicated to all staff. The minimum interval between updating and re-issuing a policy will be 2 years.

3.2 Objectives and Targets

Objectives and targets have been set for the site taking into account the significant hazards and environmental aspects of the job, the group objectives and client and contractual requirements. These are documented in the **Site Objectives and Targets**.

Additional objectives and targets will be set specifically for activities identified for upcoming works throughout the lifecycle of the project and recorded in the Site HSEQ Management Meeting. Performance against all HSE objectives will be monitored on a monthly basis at the Site HSEQ Management Meeting.

4. LEGAL AND OTHER OBLIGATIONS

The following documents provide further information in regards to this topic:

- **HSE Legal and Compliance Requirements Standard**
- **HSE Legal Obligations Directory**
- **Plant Registration Obligations Directory**
- **Utility Provider Obligations Directory**

4.1 General

The statutory and contract requirements for this site have been identified within the Company **Legal Obligations Directories** (available on Company Intranet) and have been incorporated into this management plan.

4.2 Contractual Health, Safety and Environment Requirements

This Management Plan has been written to comply with the site's contractual requirements.

Contract Ref:	Brief Description of Requirement	Mgt Plan Ref
Aurora Environmental	Midland Railway Workshops - Western Paddock Environmental Specifications	Appendix 2 - 13b
2.3 Investigations, studies, projects briefs and reports	Environmental Approval - Ministerial Statement 612	Appendix 2 - 13b
RFT (2.7) Dust Control	The Contractor is required to control dust for the duration of the works.	Appendix 8
RFT (2.7) Traffic Management	The contractor shall be responsible for all aspects of traffic management during the works. The contractor must not install signage for the site which has not been previously reviewed and approved by the MRA.	Sections 11.1 & 11.2
RFT (2.7) OH&S	The contractor will arrange for monthly inspections/audits by a qualified third party.	Section 17
Attachment 1 (3) Existing Site Conditions & Services	3.3 - 3.8 Existing Services	Section 8.17
Attachment 1 (4.6) Proposed service protection	It is anticipated that all existing services will be maintained and if required protected	Section 8.17
Attachment 2 (1)	1.8 Regulatory Bodies	Section 4

General Clauses	1.9 Permits 1.11 Safety 1.11.1 Medical Services 1.11.2 OH&S Welfare	Section 4.3 Section 15.3 Section 13.1.1 Section 14
Attachment 2 (6) Services	6.1 Protection of services 6.1.1 330kV overhead lines and 132kV underground lines. 6.1.2 High Pressure ATCO gas 6.1.3 Telstra 6.1.4 Drainage	Section 8.17

4.3 Environmental Licences/Permits/Approvals

The site will adhere to the conditions of compliance within client held licences, permits and approvals as specified within the contract or as instructed in writing by the client. Georgiou will obtain licences and or permits as required by the contract to meet the statutory requirements as they relate to the works to be undertaken.

The Project Engineer will be responsible for:

- Checking with the local government / municipality to see if there are local environmental requirements.
- Identifying the environmental licences and or permits under which the site will operate
- Obtaining a copy of any client held licences/ permits/approvals to determine conditions of compliance or if not available obtaining written verification that licences and permits are held
- Obtaining Georgiou held licences and or permits
- Reviewing and recording conditions of compliance that the site is required to meet in the Site HSEQ Management Meeting
- Supply an electronic copy of all environmental licences/permits to the Environmental Coordinator within five working days of receipt
- Monitoring compliance to the conditions of the licence/permit and report on the status in the Site HSEQ Management Meeting and client as required

Georgiou will cooperate with all instructions issued by authorities.

4.4 Infringement, Improvement and Prohibition Notices

The Project Manager or delegate will ensure any infringement, improvement or prohibition notice issued by a regulatory authority recorded as a non-conformance in Georgiou's Incident reporting database (QHEST), and appropriate actions taken in a timely manner. A copy of the notice will be forwarded to the Metropolitan Redevelopment Authority Construction Manager, HSE Manager - Operations and the Environmental Coordinator within 24 hours of receipt. The Project Manager will notify these parties when the actions to address the notice have been closed out.

4.5 Availability of Statutory and other Information

Georgiou's HSEQ department maintains links to current statutory documents (Acts, Regulations, and Codes of Practice) in the Legal Obligations Directories, which are located on Georgiou's Intranet (GENIE). Georgiou subscribes to Environmental Essentials product Envirolaw which is available to all personnel through the intranet link. Envirolaw summarises environmental legal obligations, provides links to legislation and guidelines as well as providing search capabilities.

Changes in legislation are monitored by the HSEQ Department and site management will be notified where a change affects a site. The Project Manager will be responsible for ensuring all workers affected by the change are notified in accordance with section 6. The HSE Advisor will ensure the change is reflected in this Management Plan and other relevant plans and documents.

5. STRUCTURE AND RESPONSIBILITIES

5.1 HSE Organisational Structure

The site HSE organisational structure has been documented in the *Site Organisational Chart*. The Site Organisational Chart identifies the roles including the Corporate HSE Team that will support the site in fulfilling their HSE responsibilities.

5.2 Roles and Responsibilities

The Project Manager is accountable to the Construction Manager for the performance of the project and the implementation of the project's management plans. The Core Site team will acknowledge their understanding and acceptance of their site responsibilities by signing Appendix 1 in this plan.

Project Manager

The Project Manager is accountable for creating an exemplary safety culture and execution of the management system on their site. The Project Manager will:

- Be accountable for ensuring distribution and communication of plan
- Hold monthly HSEQ Management Meetings to review HSE performance and monitor implementation and effectiveness of the management system
- Ensure their direct reports fulfil their HSE responsibilities and achievement of KPI's
- Support workers to immediately stop any 'At Risk Behaviour' identified during their work activities
- Review and report their site personnel risk profiles monthly to Corporate office

Project Engineer

The Project Engineer is responsible for creating an exemplary safety culture and ensuring adherence to the management system on their site. The Project Engineer will:

- Participate in HSEQ Management Meetings
- Review, evaluate and update the Site Risk Registers and incorporate health and safety risk controls, procedures and permits into their planning processes of design review and work method statements
- Assist in the identification and resolution of HSE issues arising within their construction area of responsibility
- Close out of actions to address hazards/ incidents in a timely manner
- Supporting workers to immediately stop any 'At Risk Behaviour' identified during their work activities

Superintendent

The Superintendent is responsible for creating an exemplary safety culture and ensuring adherence to the Management System on their site. The Superintendent/Site Manager is responsible for approving the commencement of works and to allocate necessary resources to complete a job safely in accordance with the Management Plan. The Superintendent/Site Manager will:

- Demonstrate commitment to HSE by monitoring the workplace to ensure safe work practices are adhered to by way of routine checks of the workplace compliance to the Management Plan
- Demonstrating through their actions and behaviour that safety and the environment are core values
- Hold Supervisors and leading hands (Georgiou & subcontractors) accountable for the fulfilment of their HSE responsibilities, including KPI's
- Allocating work to ensure appropriate supervision for those with lesser experience
- Ensuring appropriate and necessary plant and equipment is provided for workers to carry out their work safely and without undue harm to the environment
- Stopping, rejecting or quarantining unsafe work methods, work areas, materials, plant and equipment
- Supporting workers to immediately stop any 'At Risk Behaviour' identified during their work activities
- Participating in audits, investigations and constructability reviews
- Management and HSE performance of the subcontractors utilised on site.

Supervisor

The Supervisor is responsible for creating an exemplary safety culture and ensuring workers under their supervision work in accordance to the Management System. The Supervisor will:

- Demonstrate commitment to HSE by monitoring the workplace to ensure safe work practices are adhered to by way of routine checks of the workplace compliance to the Management Plan and other GMS requirements
- Demonstrating through their actions and behaviour that safety and the environment are core values
- Hold workers accountable for the fulfilment of their HSE responsibilities and working in accordance to their JHA/SWMS, permit or safe work instruction
- Allocating work to ensure appropriate supervision for those with lesser experience
- Ensuring appropriate and necessary plant and equipment is provided for workers to carry out their work safely and without undue harm to the environment
- Stopping, rejecting or quarantining unsafe work methods, work areas, materials, plant and equipment
- Supporting workers to immediately stop any 'At Risk Behaviour' identified during their work activities
- Participating in audits, investigations and constructability reviews
- For ensuring site inductions are completed for all new workers
- Management and HSE performance of the subcontractors utilised on site.
- Authorising the purchase and use of any substance on site including substances to be used by subcontractors.

Health and Safety Advisor

To create in conjunction with the Project Manager an exemplary safety culture and implement the company's HSE management system. The HSE Advisor will:

- Demonstrate through their actions and behaviour that HSE is a core value
- Hold accountable their staff for the fulfilment of their HSE responsibilities, including KPI's
- Provide coaching and mentoring for behavioural change
- Work closely with Supervisors to assist them in understanding their health and safety responsibilities and the procedures they need to comply with
- Monitor HSE controls on site
- Collect and analyse data to review HSE performance
- Assist in the development and review of work method statements and JHA/SWMS's
- Immediately stop any 'At Risk Behaviour' identified during daily work activities
- setup and maintain the HSE notice board

All Personnel

All personnel on site are responsible for:

- Carrying out their work in a manner, which does not put themselves or others at risk of harm
- Only performing tasks for which they are competent
- Clarify with their supervisor any matter, which may put them or others at risk of harm
- Ceasing work when identified as an unsafe act and reporting
- Attending pre-start meetings
- Conducting pre-start tasks (Take 5's, plant pre-starts)
- Attending safety presentations and weekly toolbox meetings
- Reporting incidents, illness, injuries and hazards
- Participating in Fitness for Work testing and Health and Wellness programs as requested
- Assisting in achieving the site performance goals
- Working proactively with the Client
- Ensuring compliance with the requirements of the HSE management system
- Participating and adhering to SWI's and JHA/SWMS's
- Adhering to all permit requirements
- Removing or isolating any hazard identified during daily work activities
- Immediately stopping any 'At Risk Behaviour' identified during daily work activities
- Complying with statutory and regulatory requirements

5.3 Field Leadership Visits

Senior Management with an operational role or functional support shall be required to visit the site for the purpose of engaging workers in discussion in regard to HSE which may include any of the following:

- Active participation and contribution in Pre-start meetings;

- Participation in Toolbox Talks;
- Participation in the delivery of site safety messages, on-site safety programs or initiatives;
- Participation in work inspections;
- One-on-one discussions;
- Behavioural observations;
- Participation in HSEQ Management Meetings;

A record of the visit and the activity undertaken by the Senior Manager will be recorded and where appropriate feedback provided to the Site team.

6. COMMUNICATION AND CONSULTATION

The following documents provide further information in regards to this topic:

- *HSE Communication and Consultation Standard*
- *Community Relationship Management Guideline*
- *Resolution of Issues Procedure*

6.1 Internal Communication and Consultation

Communication and consultative arrangements shall be put in place to provide personnel with information and an opportunity to contribute to the Georgiou Management System (GMS) and HSE decision making.

Within 2 months of mobilisation or when 40% of the workforce are mobilised, whichever is first, a toolbox shall be held with workers to discuss as a group how health, safety and environmental consultation is going to be achieved on the site. A record of the agreed method/s of consultation will be recorded in the Toolbox Meeting minutes. New workers will be consulted on the agreed method/s of consultation at site induction.

The Site will use the methods detailed below to communicate information and consult with workers in regard to the Georgiou Management System, this Management Plan, HSE performance and sites hazards.

6.1.1 Inductions

Inductions will be completed in accordance with section 15.3.

6.1.2 HSE Notice Boards

The site will maintain a HSE notice board to display:

- Minutes of HSE meetings
- HSE Bulletins/Alerts
- Site HSE Objectives and KPI's
- Organisational Chart
- A Site Layout Plan and Emergency Evacuation Plan, Emergency contacts and First Aiders list. These will also be posted in prominent locations throughout the site as described in the site Emergency Response Management Plan.
- Risk Registers
- Site Traffic Rules
- Resolution of Issues Flowchart
- List of HS Representatives (if elected)

6.1.3 HSE Alerts /Bulletins

Incident Alerts will be used to communicate learning's and actions required to assist in ensuring incidents that have occurred in one workplace are not repeated in others. HSE Bulletins will be used to communicate information to the workplace. HSE Alerts and Bulletins shall be developed by the Site Team using the approved templates and approved by Corporate HSE Management prior to communication.

6.1.4 Health and Safety Representatives

If a HS representative is elected, consultation with workers will generally be through their HS representatives, who will be included in any consultation that affects, or is likely to affect, the health and safety of workers. Health and Safety representatives will be provided with training to fulfil their role in accordance to legislation.

6.1.5 Site Health and Safety Committee

If a request is received to establish a Health and Safety Committee this will be done in accordance with the Occupational Safety & Health Act 1984. The members of a HS committee shall be agreed in writing between the site and the workers at the workplace. At least one half of the members of the committee must be made up of:

- The workplace health and safety representative/s, if he or she consents. If there are 2 or more health and safety representatives at a workplace, those representatives may choose 1 or more of their number (who consent) to be members of the committee.
- Workers who are not nominated by the site management

As a minimum the committee shall meet every 3 months, with a meeting agenda prepared and distributed prior to each meeting and records of the meetings including attendees, actions and due dates documented and posted on site notice boards.

6.1.6 Site Meetings

The following meetings will be held on site to monitor implementation of the Georgiou Management System, review performance and communicate and consult with workers in regards to HSE:

- Site Monthly HSEQ Management Meeting (refer to 16.2)
- Pre-Start Meetings
- Toolbox Meetings
- Fortnightly Progress Meeting

Meeting agenda and minutes will be recorded, maintained and be made available when required.

6.1.7 Communication and Consultation of Risk

Communication and consultation of risk will be completed in accordance with section 7.

6.2 Resolution of HSE Issues

Within 2 months of mobilisation or when 40% of the workforce are mobilised, whichever is first, a toolbox talk shall be held with workers to discuss as a group, how health, safety and environmental issue resolution is going to be achieved on the site. Georgiou's **HSE Resolution of Issues Procedure** shall be presented and an agreement made as to whether this procedure shall be followed or alternative method/s determined. New workers will be consulted on the agreed method/s of issue resolution at site induction.

6.3 Community Communication and Consultation

At the planning stage potential community impacts and the potential issues that could arise as a consequence of Georgiou activities were identified. The controls to be implemented to minimise the impact on the community include:

- Communication notices i.e. letter drops
- Consultation with Community Groups and Stakeholders
- Media Releases
- Dilapidation Surveys
- A Community Enquiry Register

All of the above will be managed by MRA & any written forms of communication that are developed to be released to the community and contain the Georgiou name or logo must be approved by the Project Manager's Line Manager.

All communications received from external parties pertaining to the environmental aspects and impacts associated with the Site's works shall be documented and correspondence filed into the Document Management System (DMS). All community complaints shall be referred to the Project Manager or nominee or if neither of these are not available the most senior person on site. All complaints will be managed in accordance with section 13.2.

7. HAZARD IDENTIFICATION AND RISK CONTROL

The following documents provide further information in regards to this topic:

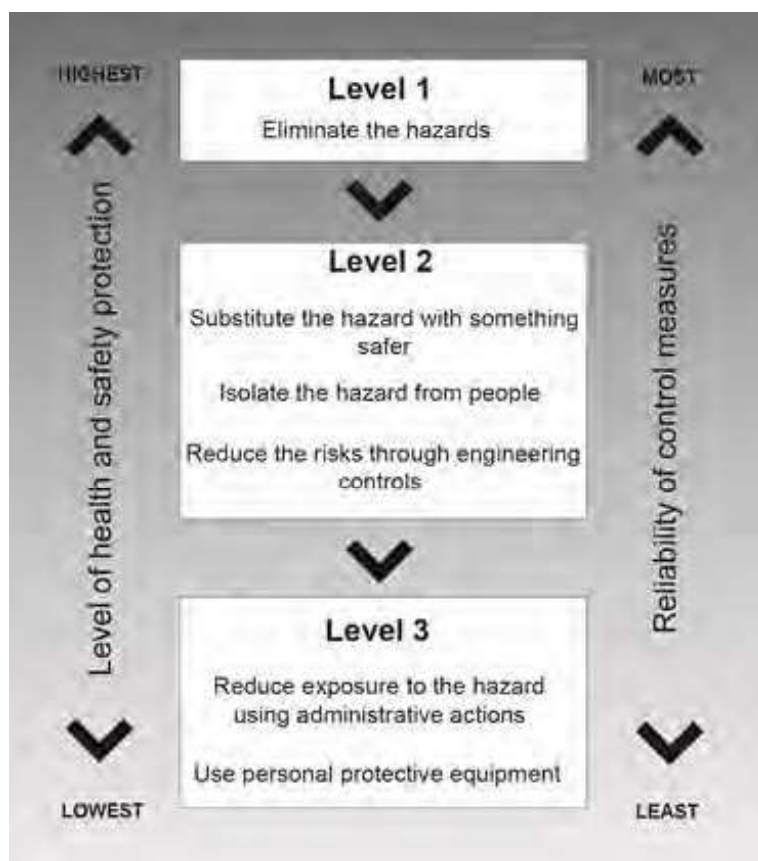
- *HSE Risk and Operational Control Standard*
- *Job Hazard Analysis (JHA) Procedure*
- *Permit to Work Procedure*
- *Change Management Procedure*
- *HSE Design Studies Procedure*
- *Management of Safety in Design Procedure*
- *Personal Protective Equipment Guideline*

7.1 Hierarchy of Control

The following hierarchy of control will be applied to controlling health and safety risks and environmental aspects within Georgiou. This hierarchy recognises that the best controls act on the environment, not on the people in it.

Hazards/Aspects

Waste



In many instances the most effective control of risk will involve a combination of the above methods

7.2 Site HSE Risk Analysis

The Site Team has undertaken a construction risk assessment workshop (CRAW) and developed a **HSE Risk Register**. The site **HSE Risk Register** is based on the Master Risk Register and incorporates the Company's mandatory controls and any additional site specific hazards and controls. This Management Plan and the **Emergency Response Management Plan** have been written to comply with the **HSE Risk Register**.

The **HSE Risk Register** will be made readily available to all workers on site and all work on site will be undertaken in accordance to the controls as contained in the **HSE Risk Register**.

7.2.1 Design & Risk Registers

Georgiou is not responsible for design in this site. The Project Engineer will be responsible for liaising with the client's designer to obtain a risk assessment covering the occupational health and safety build ability/constructability for the design. The Project Engineer together with the HSE Advisor and other technical site personnel as appropriate will review the designer's risk assessment and incorporate it into the Site's Risk Register. In the event that the client's designer is not forthcoming with a risk assessment or their provided risk assessment is found inadequate, the reviewers will undertake their own assessment to incorporate into the Site's Risk Register.

Should the site be invited to have input into the design, feedback given will include HSE threats and opportunities around build ability/constructability. This will be achieved by providing a formal risk assessment of build ability/constructability with any written design input provided. The risk assessment format will be the same as the Site's risk register.

Any changes to design by the client's designer will be assessed to identify if the design change:

- Introduces a new hazard that is not identified in the risk register
- Changes the risk of an existing hazard in the risk register

This assessment will be recorded in the Site's variation register. If the design does introduce a new hazard or changes the risk to an existing hazard then the **Management of Change - Event/ Design Form** will be used to manage the design change.

7.3 Review of Risks

Hazards/aspects within the site **HSE Risk Register** will be reviewed for adequacy:

- At monthly Site HSEQ Management Meetings
- Prior to the commencement of any new construction work that involves high impact risks not already captured
- After a significant incident
- If there is a change to be made to the construction methodology or environment as per section 7.3.1.
- If there is a variation that introduces a new hazard/aspect or alters the impact of an existing hazard/aspect as per section 7.3.1.

7.3.1 Change Management

Where there is a change to the planned scope, design or construction methodology (including plant, machinery, materials, or sequence) the impact of the change must be assessed and a determination on whether the **Change Management Procedure and/or Management of Safety in Design Procedure** applies. If so then a formal analysis of the change will be undertaken using the **Management of Change Event/ Design Form**.

7.4 Operational Control

Operations and activities associated with significant hazards and environmental aspects will be planned to ensure they are carried out under specific operating conditions. A Safe Work Instruction, Safe Work Method Statement/ Job Hazard Analysis, Take Five, Hazard Report or a combination of these shall be used to achieve this requirement.

7.4.1 Hazard Reporting

Hazard reporting will be conducted using the Hazard Report (contained within the Hazard Report/Take 5 booklet).

The Supervisor is responsible for ensuring hazards are addressed in a timely manner, using the hierarchy of control and communicated to those who may be potentially affected. Hazards that remain uncontrolled are to be reported into the QHEST system for follow-up and close-out.

7.4.2 Safe Work Instructions

Where a safe work instruction (SWI) exists for a common activity undertaken by Georgiou, this will be used when developing the Job Hazard Analysis to provide guidance on the safe work methods, anticipated hazards/ aspects & associated controls and applicable Legislation, Codes and Guidelines.

7.4.3 Take 5

Take 5 booklets will be available to all workers to perform risk assessments for work that is not high risk construction.

7.4.4 Job Hazard Analysis (JHA)/Safe Work Method Statement (SWMS)

JHA/SWMS will be completed for all high risk construction work. JHA/SWMS developed shall reflect the risks and controls identified in the sites risk register and supporting work instructions.

Subcontractors working under their own risk assessment tool shall be provided access to the sites **HSE Risk Register** to develop the risk assessment and submit to Georgiou for approval prior to undertaking work. The site will assess adequacy of the risk assessment using the **Assessment of Subcontractor SWMS/ JHA form**.

7.4.5 Permit to Work

The following work on site requires written authority in the form of a “permit to work” from the Georgiou Site Team:

- Confined Space Entry
- Excavations in all brown field sites and any excavation over 1.5m
- Hot Work (for hot work conducted outside of designated workshop areas)
- Penetrations into structures that may contain services
- Use of powered hand-held saws i.e. quickcut/demo, ring saw, chainsaw
- Work at heights where a person is exposed to a risk of falling 2 metres or more or where the level of residual risk is high for work at height below 2 metres
- High risk work to be conducted on a Georgiou site where “Authority to Commence Work” has deemed to be required by the Project Manager

No work involving these activities will commence until the appropriate permit has been completed. Person’s issuing permits on the Site will be given training in the Georgiou Permit to Work system.

A permit may be required for other high risk activities as determined by risk assessment, Project Manager and/or contractual requirements.

7.5 Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) will be selected in accordance with the type of work being undertaken and the risks involved in accordance with the **Personal Protective Equipment Guideline**. The minimum personal protective equipment on a Georgiou construction site shall be:

- Safety helmet, worn as per manufactures requirements
- Safety footwear with non-slip soles and toe protection; persons working on uneven and soft surfaces, e.g. civil construction sites, shall be required to wear lace-up safety steel cap boots,
- High visibility clothing (day/night standard), high visibility vest (if shirt / jacket is not high visibility),
- Safety glasses (wrap-around or with side shields), prescription eyewear shall be safety grade or over-goggles worn
- Suitable protective gloves for the job they are performing (carried on person)
- Long sleeved shirt and long trousers
- Hair restraint where there is a danger of long hair becoming entangled or catching fire
- P2 Dust Mask (when working in any Restricted Access Zone)

Supervisors will be responsible for reviewing their work activities to identify situations in which additional PPE e.g. face shield, hearing protection, aprons etc. may be required. Supervisors are responsible for monitoring work practices on a continuing basis to ensure that all personnel wear PPE suitable to task.

All PPE will be in good condition and comply with the relevant Australian Standard. Personnel will be provided instruction in the care, use, fitment and maintenance of PPE provided.

8. HEALTH AND SAFETY HAZARD MANAGEMENT

8.1 Asbestos

Asbestos or Asbestos Containing Material (ACM) has been identified or is assumed present on site. An **Asbestos Management Plan** has been developed to set out how Asbestos will be managed. Refer to Asbestos Management Plan in Appendix 13a & 13b of this HSEMP.

8.2 Barricading

Barricading will be erected within any working environment where hazards exist that present a threat to personnel and equipment. Hard barricading should be erected to:

- Provide warning of the existence of a dangerous condition
- Prevent personnel from making contact with an identified hazardous condition
- Prevent access to an area containing a hazardous condition or activity
- Define boundaries of hazardous locations or restricted areas

Where the risk of injury or harm to members of the public is negligible, simple barriers and reflective plastic tape or mesh may be used.

8.2.1 Openings or Penetrations

Openings or penetrations between 20cm to 2m in diameter will be covered to prevent injury from falls to persons or from falling objects. Covers are to be placed to prevent unintentional dislodgment. They will be of sufficient strength to withstand any foreseeable pressure. Temporary covers placed over an opening or penetration will not be used as a working platform and can only be removed for the purposes of installing services or for the placement of a permanent lid or cover.

8.3 Compressed Air Equipment

Compressed Air operations will only be used for its intended purpose and carried out by competent personnel experienced in the handling of the equipment being used.

Additional personal protective equipment will include:

- Eye Protection - safety glasses with side shields or Mono-goggles
- Body protection - Gloves when hands are involved with work
- Hearing Protection - Ear plugs and/or ear muffs

All pneumatic hoses and fittings must have an approved safety clip fitted. Where possible, hose fittings will be fitted with a stop flow valve. Incompatible hose fittings must be removed from site immediately.

8.4 Confined Space Entry

Confined Space Operations will be done in accordance to the **Confined Space Safe Work Instruction** and will only proceed if:

- All other options to avoid the need for confined space entry have been considered
- A JHA/SWMS has been developed
- A Permit to Work has been authorised and conditions of the permit have been communicated to everyone involved in, or affected by the work
- The persons involved are competent to do the work associated with the confined space
- All sources of energy affecting the confined space are isolated
- Testing of atmospheres is conducted, verified and repeated as often as defined by the permit conditions

- A standby person(s) is in place at all times to raise the alarm - they will not attempt a rescue
- A rescue plan is in place and known to all involved
- Unauthorised entry is prevented

The site will maintain a register of any confined space on the **Site Master Safety Register** at the workplace and appropriate signage placed at the entrance of a confined space indicating no access without permit.

8.5 Electrical Work

Electrical Work will be done in accordance to the **Working with Electricity Procedure** and AS/ NZS 3000 Electrical installations, and will only proceed if:

- A JHA/SWMS has been developed
- A test for dead has been completed prior to working on any electrical equipment
- A retest for dead has been completed after any break or change in conditions
- At least two people are in attendance when working on or close to exposed live conductors in situations where an isolation is not practicable / possible
- All isolations have been completed by a competent person(s)
- Isolation points have been clearly identified using a system of locks and / or tags
- There has been positive verification of person(s) carrying out the electrical work qualifications
- Visual inspection for damage completed

8.5.1 Work On Live Voltage Electrical Equipment

Only a qualified electrician is authorised to make decisions about whether it is safe to work on live electrical equipment (work must not be done on or near live equipment unless absolutely necessary). Under such circumstances a Safety Observer trained in resuscitation and first aid must be present and be instructed on how the power can be isolated immediately in an emergency.

8.5.2 Isolation Procedure

When electrical equipment is to be worked on the **Isolation and Tagging Procedure** will be applied.

8.5.3 Electrical Inspection, Tagging and Testing

A visual inspection will be completed on all portable electrical equipment prior to its use. RCD's are to be inspected in accordance with the **Working with Electricity Procedure**.

Tagging and testing is to be completed by a licensed person in accordance with the **Working with Electricity Procedure** and to AS/NZS 3012 Electrical Installations - Construction and demolition sites / AS/NZS 3760 In-Service safety inspection and testing of electrical equipment.

Equipment that does not have a current inspection tag, is damaged or fails any test will be withdrawn from service, tagged 'out of service' as per the **Isolation and Tagging Procedure** until tested and repaired by a competent person.

8.5.4 Power/Extension Leads

The following applies to the use of power/extension leads:

- Flexible power leads will be of heavy duty type and three core cable
- Each connection on a flexible cord that is installed or renewed at the workplace is to be either moulded one part or transparent type
- Cords are to be stored so they are protected from water, being damaged or cut.
- Wherever possible electrical leads will be run clear of floors and work areas. If lead stands are to be used they are to be insulated or non-conductive.

- The maximum length of a power tool lead is to be 5 metres when connected to a flexible extension lead.

8.5.5 Tools, Ladders and Cleaning Liquids

Only tools and equipment designed for safe work on electrical installations are to be used and will be appropriately rated and be kept in good condition. Metallic ladders (e.g. aluminium) or conductive ladders must not be used where they could come in contact with live conductors.

When cleaning electrical equipment, manufacturers' instructions on the safe use of electrical cleaning materials must be observed.

8.6 Hand and Power Tools

The use of hand and power tools will be done in accordance to the *Hand Tool Operations and Powered Tool Operations Safe Work Instructions* as follows:

- Georgiou and its subcontractors will be responsible for maintaining their tools and associated plant /equipment in a good state of repair.
- 9"/230mm grinders and 1.5mm knifing discs will not be permitted to be used on the site.
- Open blade knives such as Leatherman's and pocket knives will not be permitted on Site. An exemption applies to members of the Site Emergency Response Teams.

8.7 Hazardous Chemicals

Hazardous chemicals will be managed in accordance with the **Hazardous Chemicals Procedure, Procurement Procedure**, MSDS, statutory requirements, Australian Standards and Codes of Practice.

Site Management approval will be required prior to any hazardous chemical being brought onto site, refer to Hydrocarbon and Chemical Control Sub Plan. Where requested by Metropolitan Redevelopment Authority their approval form will be used as part of the process.

A register and inventory of all hazardous chemicals on site will be established and maintained using ChemAlert. An electronic copy of the Hazardous Chemicals Register and Inventory will be forwarded to Metropolitan Redevelopment Authority upon request.

Personnel working with hazardous chemicals will be provided with information and training concerning those materials as detailed in the MSDS.

The quantity of chemicals stored on site will be below placarding quantities and will not require a dangerous goods licence.

A **Detailed Hazard Inspection** on Hazardous Chemicals shall be conducted every 6 months and recorded on the Monitoring Schedule on the Site Master Safety Register.

8.8 Isolation and Tagging

Isolation and tagging shall be done in accordance to the **Isolation and Tagging Procedure** and only proceed if:

- Controls are identified for isolations and are documented in the JHA/SWMS
- Isolations will be by positive lock out (applying a personal lock) where possible, where this is not possible personal danger tags will be used.
- After de-energising, isolation will be confirmed by conducting a test by trying to restart the plant.

Any breaches of isolation are considered a near miss and shall be recorded in QHEST.

8.9 Journey Management

Journey Management has not been identified as being required on this site.

8.10 Slings and Lifting

Slings and Lifting Operations will be done in accordance to the **Slings and Lifting Operations Safe Work Instruction** and will only proceed if:

- An assessment of the lift has been completed and the lift method and equipment has been determined by a competent person
- A JHA/SWMS has been developed
- A trained and competent person has:
 - Checked all safety devices are operational
 - Visually inspected the lifting equipment
 - Rigged the load
 - Secured the load prior to the lift
- The weight and type of load is known and less than the Safe Working Load of the lifting device
- Operators of powered lifting devices are trained and competent for that equipment
- Clear communication is established and maintained between all persons involved in the lift
- No one is positioned under a suspended load or between suspended/lifted load and fixed objects
- Tag lines are secured to the load being lifted by the means of a suitable knot i.e. Bowline (shark hooks and the like are not permitted to be used on the end of any tagline).

8.10.1 Significant Crane Lifts

Significant Crane Lifts are defined as:

- Any load in excess of 20 tonnes
- Lifts that exceed 75% of the cranes rated capacity
- Multiple crane lifts
- Lifts that require maximum boom and crane configurations
- Lifts that require specific engineering design
- Non-routine and high risk lifts including all lifting over live process pipelines, all lifting over power lines, and lifting of personnel in a man cage

A documented **Crane Lift Study/Plan** will be undertaken for all Significant Crane Lifts in consultation with the crane drivers and rigging crew and approved by the Project Manager or his nominee prior to the commencement of the lift.

The **Crane Lift Study/Plan Form** may be used, if the crane supplier does not have a study/plan that meets the above requirements.

8.10.2 Verification of Crane Registration/ Requirements and Operators Qualifications/ Competency

Georgiou will confirm that:

- All personnel are trained, competent and hold the relevant high risk licence if they:
 - operate cranes, VLC greater than 10 metric tonnes
 - are conducting dogman or rigging duties
 - maintain or test cranes, hoists, personnel cages, lifting or rigging equipment

The site will confirm that all cranes on site will have:

- A load chart displayed in the operator's cabin;
- Current registration of Plant Certificate clearly displayed;
- An operators manual;
- A pre-start inspection completed and recorded in log book prior to operation;
- A service history record book;

8.10.3 Inspection and Testing

The Site will maintain a Lifting Equipment Register of all slinging and lifting equipment kept on site.

A visual inspection will be conducted prior to each use and as a minimum all Georgiou lifting equipment will be inspected and tested annually by a competent person.

8.11 Loading and Unloading

The Site will ensure that the transport company used for delivery or pick up from site are familiar the following site requirements:

- Correct access procedures and routes to be used (site office/lay down area location), including all required site documentation;
- Designated loading/ unloading areas;
- Correct loading methods (load limits, weight distribution, load restrained, dangerous goods placed);
- The use of over centre binders to secure loads is not permitted, ratchet type binders or webbing straps to be used for these tasks;
- Wide load, escort requirements, travel times and rules for travel to be as per local authority/ State requirements;
- Exclusion zones where there is a risk of vehicle, property or personnel interface;
- Positive communication to be maintained between the operator and spotters at all times;

- To notify site of imminent delivery or pick up;
- No person/s is permitted to be on or climb onto an open tray where there is a potential to fall;

8.12 Mobile Phones

The use of personal mobile phones is restricted outside of approved breaks. Only those issued with a Georgiou phone for business use or subcontractor supervision/management and sole traders may use mobile phones on site outside of these times. In these instances the user must:

- When travelling in a vehicle onsite park the car in safe position (even if fitted with hands free)
- If a pedestrian, remove themselves from areas of plant operation and be stationary whilst using the phone

Site supervision/management phone numbers should be provided to next of kin or others where there is a need to be contacted in the case of an emergency.

8.13 Penetrations

Penetrations into surfaces where there are suspected services will only proceed if:

- A JHA/SWMS has been developed
- A Permit to Work has been authorised and conditions of the permit have been communicated to everyone involved in, or affected by the work
- If services are suspected:
 - The location of the service that might be affected is established; and
 - An accurate diagrammatic representation of the service that might be affected is available to the work group before the work commences
 - A Permit to Work has been authorised and conditions of the permit have been communicated to everyone involved in, or affected by the work

8.14 Powered Hand- Held Saws

Powered Hand-Held Saws include, but are not limited to Quick Cut, Demolition and Ring Saws. The use of these saws is not permitted by Georgiou personnel and only approved Subcontractors will be used to conduct the work.

The use of Powered Hand-held Saws will be done in accordance with ***Hand-Held Concrete and Masonry Saw Operations Safe Work Instruction*** and will only proceed if:

- All other options to avoid the need for using the saw have been considered and the Project can demonstrate there is no practicable alternative
- The Subcontractor has been pre-qualified and approved by the Construction Manager for use
- A JHA/SWMS has been developed
- A Permit to Work has been authorised and conditions of the permit have been communicated to everyone involved in, or affected by the work
- The persons involved are trained and competent to do the work

General Manager's will be accountable for ensuring reputable concrete and masonry companies who have trained and competent personnel in the use of *powered hand held saws* are engaged within their Business Unit.

8.15 Pressurised Equipment/Cylinders

8.15.1 Storage and Handling

When storing and handling cylinders, whether they are full or empty, the following applies;

- Storage and handling will be in accordance with Code of Practice for storage and handling of dangerous goods and AS 2030 Gas Cylinders Standards.

- Stored in a secure, well ventilated place prepared and reserved for that purpose away from sources of heat or near flammable liquids or substances
- Cylinders stored in the open are to be protected from ground contact, extremes of weather and the direct rays of the sun
- Smoking or any other source of ignition is prohibited
- Cylinders are to be chained or otherwise secured in an upright position. Cylinders in transit are to be secured and must not to be dropped, thrown or dragged. They are never to be used as rollers or as a support.
- All containers of pressurised flammable gas (LPG, acetylene and oxygen etc.) will be turned off at the cylinder after each working shift
- Oxygen cylinders, because of the fire hazard, grit and grease must be prevented from entering valves.
- All valves are to be closed before a cylinder is moved. Use a trolley or special carrier where possible and remove attachments from the cylinders. If cylinders are to be lifted by a crane, specially designed cylinder holders with lifting eyes are to be used.
- Empty cylinders are to be returned to the supplier with the valves closed. Cylinders, even those marked empty, are to be treated as possible hazards and handled with great care since they still contain some gas.
- Cylinders are not to be lifted by an electromagnet.

8.16 Working at Height

Working at height is where a person can fall from one level to another, both above and below ground level.

Fall protection is required at any time, when:

- There is a risk that personnel may fall and injure themselves
- Working from any elevated work platform or man cage

Working at height Operations will be done in accordance with the **Fall Prevention Safe Work Instruction** and will only proceed if:

- A JHA/SWMS has been developed
- A working at Height Permit has been issued when:
 - there is a chance to a fall of 2.0 metres or greater
 - a risk assessment where the level of risk is not tolerable for work at heights below 2 metres
- A fixed platform with guard or hand rails is used where practicable
- All persons are competent to perform the work
- All work at height equipment is fit for purpose, inspected prior to use, tagged and maintained by competent persons
- Anchor points are tested, tagged and approved by a competent person and records kept
- Equipment found to be damaged or defective is removed from service
- All items including tools and equipment are secured
- Drop zone established under works

Fall arrest should only be used once all other options have been considered. Fall arrest equipment that has activated in the event of a fall is to be discarded. Work at height which requires a harness will require a working at height permit, JHA/SWMS and recovery plan approved by the most senior person on site or their delegate.

Work from ladders is prohibited unless the ladder is specifically designed to be used as a work platform.

8.16.1 Scaffolding

All scaffolding undertaken at the site must be supervised, erected and dismantled by a licensed and competent scaffolder and meet as a minimum, AS/NZS 1576.1 to AS/NZS 1567.4 and AS/NZS 4576 at all times. As a minimum the scaffolding must have a Scafftag completed and attached to each/every point of entry, and be maintained, inspected and certified fit for maximum is generally 30 days (by a licensed scaffolder) and prior to use after inclement weather, such as a storm.

For complex tasks, a methodology for scaffolding installation or dismantling will be required to be submitted to the Project Manager (or nominee) for authorisation prior to erecting and dismantling scaffolding.

All scaffolding will be formally inspected weekly and recorded on the Site **Master Safety register**.

8.16.2 Elevated Work Platforms (EWP'S)

All Elevated Work Platforms (EWP'S) to be used on site must have a pre-mobilisation inspection prior to arrival and are required to have a documented pre-start inspection completed prior to each use. The EWP will have a copy of its safe operating instructions and will be operated in accordance with those instructions. EWP's are to be operated, maintained and documented in accordance with Registered Plant (OSHR Part 4).

8.16.3 Ladders

Ladders will only be used for access and egress purposes when there is no practicable alternative. A person may climb or descend a ladder without fall protection provided that they use hands and legs to do so, facing the ladder and using one step at a time (3 points of contact). Ladders will be:

- accepted on the site ensuring they conform to AS 1892
- rated for industrial use
- tied off above and supported below
- placed on a slope that is no steeper than 4 units of height to 1 unit horizontally and be 900mm over the exit platform
- unless specifically designed as platform ladders, ladders will not be used as a work platform.
- inspected:
 - when originally purchased/received
 - prior to use

8.17 Existing Services

8.17.1 Overhead & Underground Transmission Lines

Georgiou will comply with and satisfy the Western Power standard requirements applicable to all works to be undertaken in close proximity to existing underground cables and overhead lines.

Georgiou will complete all forms and arrange for all necessary protection works required by Western Power to existing assets before construction works commence.

8.17.2 High Pressure ATCO Gas

ATCO Gas require that all hand-digging work within 1m of a high pressure gas pipeline is supervised by an ATCO Gas approved HP Gas Pipeline Location Officer (Approved Locator). No mechanical or machinery digging is permitted within 1m of a high pressure or city high pressure gas pipeline unless specific authorisation and instructions are given by the Approved Locator. Refer to Section 6 of the ATCO Gas 'Additional Information for the Notification of Works within 15 metres of High Pressure Gas Pipelines' for further construction requirements.

Through previous discussions with ATCO Gas confirmation of alignment and depth of the existing HP Gas pipeline will be required prior to commencement of works and construction of the truck haulage route. Service location of the HP Gas main is to be managed by Georgiou their cost. Should the existing gas main not be achieve sufficient depth (1.2m below existing ground level) Georgiou is to provide temporary protection to the existing HP gas main to the acceptance of ATCO gas and Superintendent for the duration of the works. These costs required by ATCO Gas will be borne by Georgiou.

An existing HP gas Cathodic Protection test point is located along the proposed truck haulage route. Georgiou is to protect the test point for the duration of the works to the satisfaction of the Superintendent and ATCO Gas.

8.17.3 Telstra

Existing Telstra assets are located within the Western Stockpile site. It is not anticipated this infrastructure will require protection works however Georgiou will positively locate this asset and peg out for the duration of the works.

8.17.4 Drainage

The McConnell Dowell Lloyd Street Underpass project will construct a drainage detention basin to the east of the stockpile as indicated in C-EW-01 in April 2015. Georgiou will coordinate the site compound, storage and lay down areas around this existing drainage basin. Georgiou will also allow for temporary fencing around the drainage basin.

In addition to the Lloyd Street Underpass drainage infrastructure, Georgiou is to locate and protect the existing City of Swan drainage infrastructure.

9. ENVIRONMENTAL ASPECT MANAGEMENT

The following environment aspects have been identified for the Western Paddock Remediation within the site **HSE Risk Register**. An environmental sub-plan has been developed within this Management Plan to detail how the aspects will be managed to comply with relevant legislation & client requirements and identifies the controls and responsibilities to meet obligations. These Sub Plans establish an outline of how Georgiou will manage potential impacts to comply with relevant legislation requirements and identifies the controls and responsibilities to meet legally binding obligations.

9.1 Significant Environmental Aspects

- Soil/Materials Management
- Air Quality and Dust
- Asbestos
- Erosion and sediment

9.2 Environmental Aspects

- Waste
- Water
- Hydrocarbon and Chemical
- Flora and Fauna

10. SUBCONTRACTOR AND SUPPLIER MANAGEMENT

The following documents provide further information in regards to this topic:

- ***HSE Subcontractor and Supplier Management Standard***
- ***Procurement Procedure***
- ***Permit to Work Procedure***

10.1 Selection of Subcontractors/Suppliers

Only approved contractors and suppliers will be used on the Site. When a contractor or supplier is sought that is not in the Georgiou database they will undergo a prequalification evaluation using ***Subcontractor-Supplier Pre-contract Assessment***.

The evaluation and selection of subcontractors and suppliers will be done in accordance with ***HSE Subcontractor and Supplier Management***. Subcontractors and suppliers shall be engaged using the approved commercial contracts to ensure they adhere to the ***Subcontractor-Supplier HSEQ Requirements*** included in all contracts.

10.2 Procurement

All purchasing shall be completed in accordance with ***Procurement Procedure***. Procurement risks shall be added to the site ***HSE Risk Register*** and will assess the hazard identification, risk assessment and control associated with the Site's purchasing.

ChemAlert will be used to identify possible alternative, less hazardous substances that could be used as a substitute.

The purchase of new plant will be assessed for suitability for application prior to asset requisition using the ***Plant Assessment for Purchase Form***.

10.3 Management of Subcontractors at Practical Completion

Works to be undertaken after practical completion will be authorised by the Project Manager. The Project Manager will satisfy themselves that reasonable measures will be undertaken by the subcontractor to perform the work safely. Works that involve high risk activities will require an Authority to Commence Permit as per section 7.4.5.

11. PLANT & EQUIPMENT CONTROL

The following documents provide further information in regards to this topic:

- ***Plant and Equipment Control***
- ***Worksite Traffic Management Procedure***

11.1 Public Traffic Management

The project has identified that works will be conducted in locations interacting with public traffic and a ***Traffic Management Plan (TMP)*** has been developed for this project in accordance with the Australian Standard 1742.3 (Manual of uniform traffic control devices - Traffic control for works on roads) and Traffic Management for Works on Roads- Code of Practice. The TMP details how the project will control traffic and pedestrian movement in a safe manner to provide a safe workplace for those persons conducting the works and for those people who may be affected by the works.

No works are to be conducted adjacent to existing public traffic or public pedestrian flows unless permission is given by the Georgiou Site Engineer or Site Supervisor. Traffic control at work sites on public thoroughfares will be approved by the Project Manager in consultation with the Metropolitan Redevelopment Authority.

The contractor shall be responsible for all aspects of traffic management during the works.

The contractor must not install signage for the site which has not been previously reviewed and approved by the MRA.

11.2 Site Traffic Rules

The Project Engineer will be responsible for developing and maintaining the **Site Traffic Rules**. The Project Manager, Project Engineer, HSE Advisor & Site Supervisor will ensure personnel understand the **Site Traffic Rules** for the area they are working in through inductions, pre-start meetings and displaying **Site Traffic Rules** poster prominently on site.

11.3 Mobile Plant and Light Vehicles

11.3.1 Specific Light Vehicle Requirements

All light vehicles on the site will:

- Have current registration and be appropriately insured
- Have an amber flashing/revolving light installed
- Have two way radio available with the vehicle
- Have seat belts for all passengers
- Have a risk assessment completed
- Have a pre mobilisation inspection completed by a qualified and competent person (i.e. mechanic), prior to being authorised for use on Site
- Have a current, up to date service history (log book) available
- Have a first aid kit within the vehicle

11.3.2 Specific Mobile Plant (excluding light vehicles) Requirements

All Mobile Plant on site will:

- Have a risk assessment conducted
- Have a current, up to date service history (log book) available
- Have reversing alarms
- Have an amber flashing/revolving light installed
- Have seat belts
- Have appropriate registration and certification as required
- Have documented prestart inspections
- Have an Operator's manual
- Have a fire extinguisher
- Have appropriate registration and certification as required
- Have chains, tested and tagged as required
- Have regulatory Authority plant registration and be appropriately insured
- Have a pre mobilisation inspection completed by a qualified and competent person (i.e. mechanic), prior to being authorised for use on Site
- Have isolator switches clearly visible to lockout the energy sources
- Have Roll Over Protection (ROP)

All Mobile Plant, including subcontractors and supplier plant will be inspected using the **Site Plant /Equipment Compliance Checklist** prior to authorising the commencement of operations to verify the above requirements.

11.3.3 Operator Rules

When operating a light vehicle or mobile plant including supply delivery vehicles the following conditions apply:

- The use of a mobile phone, music device and earphones is not permitted unless the vehicle and the task being undertaken is stopped and the vehicle is parked safely
- Amber flashing/revolving light to be used when the vehicle is in designated areas
- Headlights are to be on at all times the vehicle is mobile
- Drivers must have a current license and verified as competent
- A documented pre-start check is to be completed prior to each start up

- Physical check to be completed before starting machinery to ensure no personnel or vehicle is in the vicinity of the machine
- Designated speed limits, signs and exclusion zones are complied with
- Report identified hazards
- Right of way is given to larger equipment
- A minimum distance of 30 m is maintained when following plant/vehicles
- Only overtake if it is safe to do so, when there is clear unrestricted vision and there is acknowledgement from the operator being overtaken
- Passengers are only permitted in plant/vehicles with designated seats and seatbelts
- Never park/pass under suspended loads/cranes/work platforms
- Reverse or drive through parking at all times
- Personal vehicles are to be parked in designated areas only
- Not park construction vehicles directly in front of or behind plant (stationary or otherwise)
- Use two way radio contact to communicate to other operators on site
- Make positive communication with heavy plant operators before entering plant/truck "Dangerous Shadow" areas - must communicate who they are, where they wish to go, what they are intend to do, how positive contact will be maintained with operators, and confirm departure from the area

11.3.4 Mobile Plant Maintenance

Mobile plant will have a log book to record prestart checks. Maintenance of Georgiou mobile plant will be performed by the Georgiou Plant Department and records maintained.

Other mobile plant working on site will be maintained by the subcontractor or supplier unless otherwise agreed to by Georgiou. Maintenance records will be obtained and recorded into the Site Master Safety Register for mobile plant not maintained by Georgiou. The Site will monitor that the maintenance schedule is maintained.

11.4 Registered/Classified Plant

Any registered/classified plant, as outlined in the *Plant Registrations Obligation Directory*, will have evidence of registration displayed on plant, and the details recorded on the Site Master Safety Register.

11.5 Plant and People Interaction

The following will be applied to minimise the risk of plant and people interaction:

- Works will be planned to avoid heavy plant and people working together whenever possible
- Personnel are to made aware of Heavy vehicle "Dangerous Shadow" areas while moving or working around this type of equipment
- Mobile plant operators and ground workers will wear high-visibility clothing
- When spotters are used they must keep in constant visibly and verbal contact with the Mobile Plant Operator
- Permission to work within the Dangerous Shadow areas can only be given by the Project Manager. A JHA/SWMS will be completed prior to work to be performed within Dangerous Shadow areas of the Mobile Plant. The JHA/SWMS will stipulated positive communication will be maintained at all times by verbal radio communications between operator and person/s working inside the Dangerous Shadow areas - eye contact and/or hand signals alone are NOT adequate communication. The JHA/SWMS will be signed off by both the worker/s and the mobile plant operator
- Mobile plant operators are to stop work immediately if a person or light vehicle enters the Dangerous Shadow area without the operator's consent
- When personnel require entry into the Dangerous Shadow areas of any mobile plant that mobile plant is to shut down and ground all Ground Engaging Tools (GET) prior to the personnel approaching the mobile plant.

11.6 Towing/Extracting Mobile Plant or Light Vehicles

Appropriate snatch straps and wire slings will only be used for the purpose of towing equipment or extricating plant or vehicles from bogged conditions. Under no circumstances are chains to be used for this purpose.

12. CLOSURE AND COMMISSIONING

At completion of this project, Georgiou will hand over the site in an environmentally sound and safe state in accordance with legislative & contract requirements.

13. INCIDENT, EMERGENCY AND CRISIS MANAGEMENT

The following documents provide further information in regard to this topic:

- *Emergency Preparedness and Response Standard*
- *HSE Reporting and Investigation Procedure*

13.1 Emergency/Incident Planning and Control

The site has in place an *Emergency Response Management Plan (ERMP)* that addresses emergency response, control and recovery based upon credible emergency scenarios as identified in the Site *HSE Risk Register*.

13.1.1 First Aid Facilities & Emergency Equipment

The Site has assessed the first aid personnel and equipment requirements based upon site demographics and its assessment of the risks and credible emergency scenarios. This assessment is recorded in the *ERMP*. The *ERMP* documents who will be responsible for monitoring the first aid supplies and that they remain adequate.

13.2 Notifications & Reporting

The Project Manager is accountable for ensuring all necessary reporting and notifications take place in accordance with this plan and the *HSE Reporting and Investigation Procedure*.

13.2.1 Internal

The HSE Advisor or their delegate will be responsible for reporting all incidents into QHEST database (Quality, Health, Environment and Safety Tool) within 24 hours, where resources are available. Incidents reported into QHEST will be reviewed by the Responsible Manager and approved within five working days or before month end in which the incident occurred.

13.2.2 Notification of Incidents to Metropolitan Redevelopment Authority

Site Management Team will notify Metropolitan Redevelopment Authority of any incidents as soon as reasonably practicable, in the event that there is an Incident.

Metropolitan Redevelopment Authority will be provided with copies of Georgiou incident reports and investigations within 3 days.

13.2.3 Statutory Notifications

Notifications to regulatory authorities will be conducted after consultation with the HSEQ Manager who will ensure Metropolitan Redevelopment Authority has been informed of our intention to notify the authority.

13.2.3.1 Environmental

Notifications to regulatory authorities will be conducted after consultation with the HSEQ Manager who will ensure Metropolitan Redevelopment Authority has been informed of our intention to notify authority. Requirements for reporting incidents to Statutory Authorities will be based on the following criteria:

- Breaches to the Environmental Protection and Biodiversity Conservation Act 1999 shall be reported within 7 days once identified to the Department of Sustainability, Environment, Water, Population and Communities;
- Identification of Declared Weed Species shall be reported within 7 days of identification to the Department of Agriculture and Food;
- Uncontrolled fires likely to result in serious environmental harm shall be reported to the Department of Environment and Conservation within 24 hours of identification of the incident occurring; and
- Unauthorised discharges or other incidents likely to cause serious environmental harm shall be reported to the (WA), EHP within 24 hours of identification of the incident occurring.

13.2.3.2 Health & Safety

The following must be reported immediately to Worksafe WA:

- death; or
- serious injury including:
 - A fracture of the skull, spine or pelvis
 - A fracture of any bone in the arm, other than in the wrists or hand, or in the leg, other than a bone in the ankle or foot
 - An amputation of an arm, a hand, finger, finger joint, leg, foot, toes, or toes joint
 - The loss of sight of an eye
 - Any injury other than those referred to above which, in the opinion of a medical practitioner, is likely to prevent the employee from being able to work within 10 days of the day the injury occurred.
- Infectious diseases including tuberculosis, viral hepatitis, legionnaire's disease and HIV where these diseases are contracted during work involving exposure to human blood products, body secretions, excretions or other material which may be a source of infection.
- Additional diseases including Q fever, anthrax, leptospirosis and brucellosis where these diseases are contracted during work involving the handling of, or contact with, animals, animal hides, skins, wool, hair, carcasses or animal waste products.

13.2.4 Electrical incident reporting

All electric shocks and accidents irrespective of their seriousness must be reported to relevant Network Operator. If the person making the report cannot identify the network operator, the fact must be reported to Energy Safety. Notifications will be conducted after consultation with the HSEQ Manager who will ensure Metropolitan Redevelopment Authority has been informed of our intention to notify.

13.2.5 Federal Safety Commission (FSC) Reporting Requirements

The Site is a non FSC Scheme project with a value less than \$3 Million and any reporting requirements will be administered by the Corporate HSEQ Department.

13.2.6 Utility Provider/Network Operator Reporting Requirements

The Utility Provider/Network Operator should also be contacted in all cases if the asset is damaged or has the potential to cause further harm.

13.3 Investigations

Investigations regarding the incident will be completed in accordance with the ***HSE Reporting and Investigation Procedure*** and commence as soon as practicable (preferably immediately) but within 24 hours.

13.4 Review and Communication of Incidents

Incidents will be reviewed to check that causal factors and root causes were identified and that the findings have been effectively addressed through assignment of action/s at the:

- Site's HSEQ Management Meeting
- Business Unit HSE Management Meeting
- OHS Committee Meeting (if established)

High potential and major incidents will be reviewed by senior management to ensure adequacy of closeout. HSE incidents and their preventative actions/learnings will be communicated at pre-start meetings, toolbox meetings and through safety alerts/bulletins as per section 6.

14. HEALTH AND WELLNESS

The following documents provide further information in regards to this topic:

- *Health and Wellness Standard*
- *Injury Management Procedure*
- *Working Environment Procedure*
- *Fitness for Work Policy*
- *Drug and Alcohol Testing Procedure*

14.1 Prevention Programs

The site will participate in the Company Health and Wellbeing programs as required. Site specific targeted education programs may be developed as required addressing high risk areas.

14.1.1 Nut 2 Guts

Georgiou's Nuts 2 Guts musculoskeletal injury prevention program comprises of an initial training session, daily prestart warm up routines and refresher sessions periodically.

14.2 Fitness for Work

14.2.1 Drugs and Alcohol

In accordance with Georgiou's *Fitness for Work Policy*, no worker shall report to work:

- with a Blood Alcohol Content ("BAC") or Breath Alcohol Content ("BrAC") greater than 0%
- under the influence of illicit drugs
- under the influence of prescription drugs unless they have been prescribed by a doctor and are being taken in accordance with the prescription and do not have adverse side effects
- under the influence of over the counter drugs unless they are being taken in accordance with the directions and do not have adverse side effects

Workers shall:

- not possess, use, consume, distribute or sell alcohol, illicit or un-prescribed drugs or misuse prescribed medication while performing work for Georgiou;
- inform their supervisor when they are using prescribed medication that may impair their behaviour or performance; and
- inform their supervisor if they are aware or suspect another person is not fit for work.

Daily blanket alcohol/breathalyser testing will be undertaken and the Site will conduct, at its discretion, drug testing. Georgiou shall conduct drug and alcohol testing in accordance with Georgiou's ***Drug and Alcohol Testing Procedure***. Workers returning positive results will not be permitted to return to work until they have been appropriately assessed and cleared to return to work in accordance ***Drug and Alcohol Testing Procedure***. This may include referral to other professionals and implementation of a ***Personal Fitness for Work Plan***.

14.2.2 Working Environment

14.2.2.1 Occupational Noise

Workers will not be exposed to daily occupational noise levels higher than LAeq, 8h of 85 dB. If personnel are potentially exposed to hazardous levels of noise, controls will be implemented in the JHA/SWMS including but not limited to:

- Isolating people from the noise source
- Task rotation
- Provision of PPE and training in its correct use and care
- Double hearing protection (earmuffs and earplugs) in areas exceeding noise levels.

14.2.2.2 Vibration

If personnel are potentially exposed to hazardous levels of vibration, controls will be implemented in the JHA/SWMS which may include but not limited to:

- Task rotation
- Isolating people from the vibration source
- Adequate seat suspension in plant
- Provision of anti-vibration PPE

14.2.2.3 Working in Heat

Strategies to control or minimise the effects of working in the heat on site may include, but are not limited to provision of the following:

- Shaded work areas where possible;
- Heavy, physical work scheduled for the early or cooler times of the day;
- Regular rest periods and alternate work crews where possible;
- Meetings and training conducted in cool or air-conditioned areas;
- Ample drinking water at the work location;
- Personal protective equipment (tightly woven, light coloured, loose cotton clothes are preferable);
- Hard hats fitted with broad brims and neck flaps;
- Tinted safety glasses
- 30+ SPF Broad spectrum water-resistant sunscreen;

Hydration tests will be performed on workers to monitor their wellbeing to assess their fluid intake and acclimatisation to their working environment.

14.2.2.4 Smoking

Smoking is only permitted in designated smoking areas and is prohibited in plant and light vehicles. Appropriate non-smoking signage will be displayed on site including areas where flammable substances are stored.

14.2.2.5 Manual Handling

Employees will be provided with information in regards to manual handling at their company induction in accordance with 15.3.1. Manual Handling hazards will be identified through the applicable risk assessment and the

risk reduced to an acceptable level prior to the activity being undertaken. The hierarchy of controls shall be applied and the need to perform the task eliminated, where possible, through the use of mechanical means or changes made to the work environment.

Manual Handling Operations will be conducted in accordance with the ***Manual Handling Operations Safe Work Instruction***.

14.2.2.6 Housekeeping

All site personnel shall be responsible for good housekeeping, reporting and addressing hazards. Inspections of the worksite will be regularly completed as per section 17.1.1.

14.3 Fatigue Management

14.3.1.1 Hours of Work

The maximum period of work will be a 12 hour shift with no more than 13 day shift consequently per fortnight. Provision shall be made on all shifts for appropriate rest breaks during and between works periods to ensure workers have adequate opportunity for rest.

Any changes to the permanent hours of work and shifts will be approved by the Project Manager and Metropolitan Redevelopment Authority.

Permission to work night shift will be obtained from Metropolitan Redevelopment Authority. When night work is performed there will be a minimum of ten hours rest scheduled between day/night shifts.

14.3.2 Health Surveillance

The Site legal review and risk assessment identified no requirements for health surveillance arising from the construction works to be performed.

Should the work scope change significantly and health monitoring becomes a requirement, the Site HSE Risk Register shall be updated to record the new requirements.

Where health issues specific to an individual have been identified, an ***Individual Health Management Plan*** may be developed if deemed necessary, which may include health surveillance.

14.3.3 Injury Management

Work related and non-work related injuries including illness will be reported, treated and recorded in accordance with the ***Injury Management Procedure***.

All first aid treatments will be carried out by the nominated First Aiders located at the site. If an injured person is to be transported to outside medical facilities, the Project Manager or Engineer will nominate a responsible person to accompany the injured person to the doctor or hospital and remain in attendance.

Georgiou's Injury Management Coordinator will be contacted as soon as practical to assist in the coordination and management of the injury.

Workers who are placed on restricted duties will have a ***Return to Work Program*** developed for them in consultation with the treating doctor and the Injury Management Coordinator. The nominated responsible person will discuss with the treating doctor the alternate duties available for the most medically appropriate early return to work and recuperation of the injured worker.

The Injury Management process is described for workers in the ***Care Plan*** developed for this site.

14.3.4 Employee Assistance Program

The Employee Assistance Program is a confidential counselling service available to employees and their families. This service may also be offered to subcontractors if they are involved in an incident on a Georgiou Site and their employer does not provide the service.

15. TRAINING, COMPETENCY AND RESOURCING

The following documents provide further information in regard to this topic:

- *Training and Assessment Standard*
- *Project/Facility Training Needs Procedure*
- *Development, Review and Approval of Training*
- *Training and Development Requests*
- *Licencing and Training Obligations Directory*

15.1 Identification of Site Position, Role Skills & Qualification

The site will develop and maintain a **Site Training Analysis** to identify the roles required for their works and the specific training, awareness and qualifications required to:

- undertake the role's duties competently
- meet legal and contractual obligations
- meet Company requirements

15.2 Site Training Needs

The **Site Training Matrix** will be monitored for outstanding training needs and expiry of Georgiou personnel certificates and tickets at the Site's HSEQ Management Meeting.

15.2.1 Communication and Consultation with Workers

Workers will be consulted in identifying training needs in relation to performing their work activities in a competent and safe manner by:

- HS Committees being consulted in safety training requirements for the site (if established)
- Participation in creation and sign off applicable Job Hazard Analysis, that identifies qualifications and licenses required to perform the job safely

15.2.2 Verification of Skills & Competency

At induction the site will verify workers hold the required skills and qualifications for the role they will be assigned.

Any training needs will be recorded and monitored during life of the Project. Training needs will be discussed at the site's Monthly HSEQ Management Meeting.

Records of skills and qualifications of Georgiou employees will be maintained in the Company's Database which is accessible to site. Subcontractor records will be held on site.

Each worker will be required to review and sign onto their JHA/SWMS which will stipulate the licenses, certificates and assessments for the role the individual is signing onto. A person signing onto a role is verifying they hold the current skills and qualifications for the role they have been allocated. If a person does not hold a current and valid

skill and qualification as identified for the role in they will not sign onto the JHA/SWMS and they will inform their Supervisor.

15.2.3 Georgiou Assessed Competency (GAC)

Recognition of competency shall start at the induction. Certification from recognised training organisations (RTO) will be collected at induction.

In addition to this all operators, regardless if they hold a certification, are to also complete a Georgiou Assessed Competency (GAC) prior to commencement of plant operations. A subject matter expert is to assess the operator and complete the GAC paperwork.

Georgiou Assessed Competency shall be conducted by Georgiou subject matter specialist who holds certification or GAC for that piece of plant. The assessor shall:

- Explain assessment process (conditions, objectives and performance measurement)
- Observe and assess all criteria for the practical assessment
- Complete GAC assessment results
- Sign and have the operator sign the assessment
- Obtain supervisor comment and sign off
- Provide a copy to the operator

Only operators who have satisfactorily completed the assessment for the plant they have been assigned are authorised to operate plant on Georgiou sites. Labour Hire whom are deemed not competent or have been involved in an incident as a result of negligence, are to be identified on the labour hire register and are not to return to a Georgiou site. Labour hire and Subcontractor evidence shall be retained with the induction whilst the Georgiou evidence shall be entered into the Georgiou training system (LEAP).

15.3 Induction

Georgiou Inductions will be conducted in accordance with *Training and Assessment Standard*.

15.3.1 Company Inductions

All Georgiou employees will be required to complete the company induction as part of their on-boarding process prior to commencing work at site which includes:

- Legal and other obligations
- Hazard identification and reporting
- Incidents and injury/illness reporting
- Fitness for work obligations
- Manual handling
- Muscular skeletal injury prevention program (known as N2G)
- Correct use and selection of PPE
- Employee assistance program (EAP)

15.3.2 Site Induction

All workers will be required to undertake the Georgiou site induction before being authorised to commence work which will include:

- Legal and other obligations
- HSE objectives and initiatives
- Major hazards (high risk work) and environmental aspects and control measures
- Hazard identification and reporting
- Site specific rules and procedures
- Site orientation i.e. access, location of amenities, site layout plan, site traffic rules
- Fitness for work obligations
- Consultation and Resolution of Issues process
- Incidents and injury/illness reporting
- Emergency response procedures

A site induction record will be completed and records kept for the duration of the project.

Persons undergoing this induction will be provided with an induction sticker to place on their safety helmet, which will have a unique number, date of issue and person's name.

15.3.3 Visitor Inductions

Visitors will be escorted at all times during their site visit and are not permitted on site unattended unless approved by a senior Georgiou representative.

The visitor will be required to sign onto the Prestart Meeting minutes so they are made aware of the site activities and relevant hazards during their site visit. In addition they will be required to sign a Visitor Book/Register.

15.4 Training Delivery

15.4.1 Creation of Site Training Materials

Training packages that are created for the delivery on site, excluding toolboxes, will be approved by the Learning and Development Department prior to delivery in accordance with the ***Development, Review and Approval of Training Procedure***. Persons with appropriate qualifications and experience will carry out training.

15.4.2 Recording of Training and Assessment

Records of training and assessment will be maintained by the HSE Advisor and will be readily available for verification.

16. CONTINUAL IMPROVEMENT REPORTING

16.1 HSE Reports

16.1.1 Monthly Reports

The Project Manager will provide a monthly report to Metropolitan Redevelopment Authority on health and safety HSE performance using the ***Monthly HSEQ Performance Report***. The Project Engineer is responsible for the preparation and submission of the report. The report as a minimum will provide an overview of the month's incidents, injury statistics, site health and safety HSE KPI's, address any health and safety HSE issues and outline corrective actions from previous reports in addition to any specific client requirements.

16.2 Site Monthly HSEQ Management Meetings

The Site will hold a monthly HSEQ Management Meeting in accordance with section 6.1.6 to monitor:

- Performance against HSEQ objectives, targets and initiatives
- The implementation of the key elements of the Georgiou Management System
- Close-out of incidents, non-conformances, audit and inspection findings and identify trends
- Implementation and effectiveness of HSE Management Plans

The HSEQ Management Meeting shall comprise of management, key personnel and major subcontractors where possible. Records of HSEQ Management meetings shall be kept using the ***Site HSEQ Management Meeting Minutes Template***.

16.3 Project Performance Review

At completion of the Project, the Project Manager is responsible for arranging a review of project performance which will include HSE management performance and lessons learnt for the purpose of continually improving Georgiou Management Systems. This review will be in accordance with the ***Project Closeout Procedure***.

17. AUDITING, REVIEWS AND INSPECTIONS

The following documents provide further information in regards to this topic:

- ***Auditing, Reviews and Inspections Standard***

17.1 Inspections

17.1.1 Workplace

The HSE Advisor is responsible for ensuring the workplace inspection schedule is maintained and inspections are completed in accordance with ***Auditing, Reviews and Inspections Standard***. The schedule will allocate the type of inspection and the frequency required for each type of inspection to be carried out. Inspections will be organised to involve participation of subcontractors.

There are three levels of inspections covered by the inspection schedule:

- Daily Inspections (daily and recorded on JHA/SWMS where relevant)
- Workplace Inspections (weekly and recorded on Inspection checklist)
- Detailed Hazard Inspections (considering timing/availability of activities)

17.1.2 General Maintenance, Inspection and Testing

The maintenance, inspection and testing of plant and equipment must be carried out and documented evidence of compliance must be retained on the ***Site Master Safety Register***. This applies to:

- scaffolding, and other equipment capable of working at height,
- all lifting and rigging equipment,
- portable electrical equipment and power generators (power packs, generator sets, portable welding sets, etc.),
- emergency equipment,
- medical/first aid equipment,
- gas cutting, flash back arrestors and welding equipment,
- gas detection units,
- compressors/receivers.

A classified/registered plant register together with copies of the certificate and inspection documentation will be maintained with copies and documentation available on demand.

Electrical equipment will be inspected as per section 8.5.3.

17.2 Audits & Reviews

The following audits are scheduled for this site:

Internal Audit/Review	Purpose	Commencement	On-going requirement
Site HSE Health Check	Review achievement towards site start-up activities	Approx. 4 weeks after mobilisation	N/A
Environmental Compliance Review	Review compliance to significant aspects, statutory or contractual requirements which may include licences, permits and reporting	6 weeks	N/A
Internal HSEQ audit	Determine compliance to the management systems and an assessment as the effectiveness of those requirements to meet our legal and other obligations	6 weeks	N/A
Third Party Inspection/Audit	Determine compliance to the management systems and an assessment as the effectiveness of those requirements to meet our legal and other obligations	Monthly	Life of Project

The HSE Advisor will be the principal contact for external auditors wishing to audit the Site's HSE systems. The HSE Advisor will be responsible for responding to any external audits findings.

17.3 Corrective Actions

Corrective actions identified through hazards, inspections, incidents, auditing will be recorded in QHEST. Close out of corrective actions are monitored through the Site HSEQ Management Meeting, and reported to senior management through the monthly and quarterly board reports.

18. DOCUMENT AND RECORD CONTROL

Georgiou's Health, Safety and Environment Policies, Standards, Procedures, Work Instructions, References, Guidelines, Forms, Templates are all accessible via the Company's Intranet - GENIE. GENIE will maintain the current and only authorised versions for use.

Health, Safety and Environment documentation that have been specifically developed for the Site, including this plan, will be controlled on site and recorded on the **Site Document Register** in accordance with the Site **Quality Management Plan**.

The Project Manager is the owner of this plan and will apply change control to ensure the most recent plans are approved and executed.

19. APPENDICES/ATTACHMENTS

- Appendix 1- Acceptance of HSE Accountabilities & Responsibilities
- Appendix 2- Waste Management Sub Plan
- Appendix 3- Water Management Sub Plan
- Appendix 4- Hydrocarbon and Chemical Control Sub Plan
- Appendix 5- Flora & Fauna Sub Plan
- Appendix 6- Cultural & Heritage Sub Plan
- Appendix 7- Soil Management Sub Plan
- Appendix 8- Air Quality and Dust Sub Plan
- Appendix 9- Noise and Vibration Sub Plan
- Appendix 10-Weed, Pest and Disease Management
- Appendix 11- Fire Management Sub Plan
- Appendix 12 - Acid Sulphate Soils and Dewatering Sub Plan
- Appendix 13a - Non Friable Asbestos Management Sub Plan
- Appendix 13b - Friable Asbestos Management Sub Plan

Appendix 1 - Accountabilites and Responsibilities

Position	Name	Signature	Date
Project Manager			
Project Engineer			
Superintendent			
Supervisor			
HSE Advisor			

HSE Management Plan

Western Paddock Remediation



Appendix 2- Waste Management Sub Plan			Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of this plan)		Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Project Objectives & targets		Project Manager
Training and Competency	Workers will be informed of:		Project Manager
	<ul style="list-style-type: none"> The types of waste generated on site; How the wastes are to be handled, stored and disposed of. Personnel responsible for clean-up of spills will be provided with instruction on how to use the sites spill kits. Personnel handling hazardous materials will be provided training to read and understand the MSDS. 		
	Unidentified Waste	Wastes that cannot be positively identified (i.e. unlabelled liquids, potential asbestos) will be tested before handling and disposal. Any material that is unknown should be considered hazardous until positively identified.	Project Engineer
	Handling	<ul style="list-style-type: none"> Where practicable, dust generating rubbish and debris will be removed to minimise dust release into the atmosphere. Handling of waste will be done in accordance with relevant state or local by-laws using suitable personal protective equipment. 	Project Engineer
	Storage	<ul style="list-style-type: none"> Containers used for storage are not to be opened, handled, transported or stored in a manner that may rupture the container. All waste will be stored in waste receptacles and removed off site by a licensed contractor on a periodic basis. Dedicated recyclable and hazardous receptacles will be labelled. Wastes stored on site will be stored in a manner to prevent the attraction of vermin and native wildlife. Waste is to be stored away from access and egress routes. The quantity and volume of wastes stored on site may be minimised where reasonably practical to reduce the risk to health, safety and the Environment. 	All
Disposal	<p>In deciding how to dispose of waste generated on site, consideration will be given to reducing, reusing or recycling waste where reasonably practical to minimize the volume sent to landfill. Where reuse or recycling is not a feasible option, the waste will be sent to a facility capable of accepting the waste.</p> <ul style="list-style-type: none"> The burning of any type of wastes will not be permitted on any Georgiou site. The use of stormwater drains for the disposal of waste is prohibited. 		Project Engineer
Transportation	<ul style="list-style-type: none"> The removal and transportation of hazardous waste/ controlled waste (e.g. asbestos, hydrocarbons, and sewage) for disposal will only be conducted by licensed carriers. A copy of all controlled waste carrier licenses are maintained on the Controlled Waste Carrier Register on the DMS by the Environmental Coordinator. The Environmental Coordinator is responsible for ensuring the Controlled 		Project Manager

HSE Management Plan

Western Paddock Remediation



Appendix 2- Waste Management Sub Plan

Appendix 2- Waste Management Sub Plan		Responsibility
	<p>Waste Carrier Register is up to date. Licensed operators will be engaged in accordance with the Procurement Procedure.</p> <ul style="list-style-type: none"> Before a hazardous waste/ controlled waste is transported off site, a waste tracking receipt will be collected from the operator as verification that the waste was correctly transported off site and to identify the proposed location for disposal. The receipt will be scanned and filed into the DMS and linked to the Site Waste Register. A copy of the receipt will be held for a minimum of 3 years. The transportation of other wastes for disposal will only be conducted if the load is covered or there is no risk of load/debris falling and the load is disposed of at a registered landfill. 	
	<ul style="list-style-type: none"> Hazardous wastes will be stored in sealed containers where practical and clearly labelled with waste type. Hazardous waste receptacles will be maintained in good condition to prevent leaks or spills. Offensive odours should not be generated at any time when stored. Hazardous wastes with a significant risk to human health and safety will be stored in containers that comply with relevant legislation and guidelines. Hazardous wastes will not be permitted to accumulate to a level that presents an unreasonable risk to human health, safety or the environment. Controlled waste storage will be suitably contained to ensure debris does not travel beyond the boundary of the premise. Hazardous waste will be stored and segregated in accordance with their MSDS. Hazardous waste will be risk assessed to ensure they do not contaminate or interact with goods that are incompatible. Where there may be a risk of fire, hazardous waste will be segregated to prevent storage incompatibilities. Hazardous liquid waste will not be permitted to enter the environment. Design considerations for secondary containment will be given to the storage of liquid wastes to contain any potential spills. Hazardous waste will be stored on/in banded pallets/areas which will be compliant with AS1940-2004 4.4.3 (the banded pallet/area must have the capacity to contain 110% of the largest container). Hazardous waste such as batteries, hydrocarbons, sewage and asbestos will only be handled for final disposal / recycling by certified waste removing contractors. Sewage waste not plumbed directly into the main sewerage system will be contained within holding tanks on site compounds and emptied on a periodic basis or as required by a licenced contractor. The management and handling of hazardous waste will be in accordance with the Company's Hazardous Materials Procedure. 	All
Hazardous Waste - General		
Hazardous Waste - Asbestos	<ul style="list-style-type: none"> The disposal processes for asbestos, will involve independent competent persons. Identified ACM (Asbestos Contaminated Material) will be clearly marked out and controls put in place to prevent contamination into surrounding areas. 	Project Manager
Hazardous Waste - Sanitary/ Sewage Waste	<ul style="list-style-type: none"> Sewage waste will either be plumbed directly into the main sewerage system or contained within holding tanks on site compounds and emptied as required. Sewage waste stored in banded tanks underneath the toilets will be emptied by a licensed contractor 	Project Engineer

HSE Management Plan

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Appendix 2- Waste Management Sub Plan		Responsibility
	<ul style="list-style-type: none"> Sanitary wastes will be stored in solid containers and clearly labelled for identification. Sanitary wastes will not be re-handled after disposal to minimise the exposure and risk of double handling. Sanitary conveniences will be calculated based on the number of workers based on the site and meet legislative requirements. Sanitary waste will be stored away from food sources or where food is served. Controls to prevent offensive odours to the public and workers will be implemented. 	
	<ul style="list-style-type: none"> On site waste will be put into a comingled bin and transported to a recycling facility and segregated as appropriate. Waste will be collected by a provider who segregates recyclable waste from general waste at its recycling facility. Green waste will be mulched for use in dust control if practicable. Aggregate will be segregated during cut and fill operations for re-use. Consideration will be given to reusing the waste on-site or supply to the local shire / community. Any waste water or liquids must be disposed of to an approved receptacle and stored within an approved bunded location until they are removed from site. 	Project Engineer
	<ul style="list-style-type: none"> Putrescibles waste will be stored into general waste containers that prevent the release of debris and leachate. The release of leachate into the environment may only be permitted if it does not present significant harm to human health, safety or the environment or generate offensive odours to the public and workers. 	Project Engineer
	<p>In the event that clinical waste has been found the following control may be employed;</p> <ul style="list-style-type: none"> Syringes and needles found on site will be stored in a clearly labelled, solid, sealed container to prevent access to contents. They will be disposed of at a licenced provider. Clinical wastes will not be re-handled after disposal to minimise the exposure and risk of double handling. 	Project Engineer
	<ul style="list-style-type: none"> Environmental inspections will be completed via ONEAPP 	Supervisor
Reporting	HSEQ Monthly Management Meeting	Project Manager

Environmental Management Plan

Western Paddock Remediation



Appendix 3- Water Management Sub Plan				Responsibility
Objectives & Targets	<ul style="list-style-type: none"> Refer to the Site HSE Objectives & Targets Document (section 3.2 of this plan) 			Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Project Objectives & targets			Project Manager
Mitigation Measures	General	<ul style="list-style-type: none"> Water should be conserved, reused and recycled where reasonably practical. At no point will any water utility asset owner's infrastructure be modified or removed without their approval. 		Project Manager
	Training and Competency	<ul style="list-style-type: none"> Workers will be informed of any significant water aspects and Site specific controls to minimise potential impacts. Emergency Management Team members will be provided training to respond to a discharge of contaminated water or hazardous substances into the environment. 		Project Manager
	Notification	<ul style="list-style-type: none"> The Site will not modify or remove any water utility assets without their approval. Notification of approval will be received by the MRA with a copy of authorisation. Notification to the asset owner will be given as per their conditions of compliance. 		Project Engineer
		<p>To control stormwater run-off to minimise potential environmental impacts the following controls will be applied, if deemed necessary:</p> <ul style="list-style-type: none"> Installation of soak-wells Construction of stormwater retention basins Minimise contours/elevations to reduce stormwater flow and divert runoff around the site Installation of flow interceptors (hay bales, rock armour, geo-synthetic fabric, sediment fences, vegetation,) to reduce water flow so sediments can drop out of suspension Stabilisation of disturbed areas through the use of mulching or revegetation Installation of diversion berms. Water were practicable will be diverted around disturbed areas, including waste storage and handing areas. 		Project Engineer
	Stormwater	<p>Where temporary erosion protection is installed for additional inflows or point source discharges, the existing soils excavated from the watercourse will, where practicable, be stockpiled in an approved location above the high bank so it can be replaced following removal of the temporary protection measures.</p> <p>Control measures to prevent contaminated stormwater run-off (e.g. stormwater affected by site's storage of chemicals, refuelling area, waste receptacles) from entering stormwater drains or natural water courses will be:</p> <ul style="list-style-type: none"> Chemicals and hazardous substances to be stored in bunded areas Site compounds and laydown areas to be located away from stormwater or natural watercourses where practicable. 		
	Groundwater Bores	<ul style="list-style-type: none"> All applicable licence, approvals and permits will be obtained from the client or relevant regulatory 		

HSE Management Plan

Western Paddock Remediation



Appendix 3- Water Management Sub Plan			Responsibility
	<p>authority before the installation of bores.</p> <ul style="list-style-type: none"> Extraction of groundwater from underground aquifers must not directly or indirectly cause environmental harm to any watercourse, lake, wetland or spring. The extraction of water from bores will be monitored as per conditions of compliance, and recorded using Water Abstraction Log When there is not a specified condition of compliance and a flow meter is not installed the Water Cart Operator will complete the Water Abstraction Log every time the bore is used. The Water Cart Operator will record the full capacity (litres) of the Plant on each occasion it is filled to ensure water extraction is not underestimated. 		
	Plant/Vehicle Maintenance	<ul style="list-style-type: none"> The maintenance and cleaning of any vehicles, plant or equipment must not be carried out in areas from which contaminants can be released into stormwater or natural watercourses. 	All
	Discharge of Contaminated Water and Hazardous Substances	Contaminated water and all other hazardous substances will not be discharged into the environment. In the event that the Site is directed to discharge contaminated water or other hazardous substances the Project Manager will obtain documented evidence that approval has been obtained from the local council or environmental department before discharging contaminated water or hazardous substances into the environment.	Project Engineer
	Monthly (Documented)	<ul style="list-style-type: none"> Environmental inspections will be completed via ONEAPP 	Supervisor
Reporting	HSEQ Monthly Management Meeting		Project Manager

Environmental Management Plan

Western Paddock Remediation

Georgiou

Appendix 4- Hydrocarbon and Chemical Management Sub Plan				Responsibility
Objectives and Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)			Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets			Project Manager
Mitigation Measures	General	<ul style="list-style-type: none"> Georgiou will develop a site plan (i.e. a diagram) showing the location of storage areas, spill kit locations, muster points, firefighting equipment and First Aid equipment including eye wash/flush locations. In the event of an emergency that involves the need for emergency services this site plan along with a product manifest is available to the emergency services. As part of the Site Induction, workers will be informed of the Site specific controls required to manage hydrocarbon and chemical storage and use including: <ul style="list-style-type: none"> Use and understanding of material safety data sheets (MSDS) Use of personal protective equipment (PPE) Emergency Management Team members will be provided training to respond to a hazardous substance spill 		Project Manager
	Training and Competency			Project Manager
	Register	<p>All dangerous goods or hazardous substances must be approved by the HSE advisor prior to use on the site</p> <p>Chemalert will be used to register all site dangerous goods and hazardous substances, manage electronic MSDS and conduct and record product risk assessments</p> <p>Consideration will be given to substitute products assessed as a high risk with a product of lesser risk</p>		Project Manager/Superintendent
	Transportation	<p>Containers holding hazardous substances or dangerous goods will be stored upright and secured during transport. Containers are not to be dropped, tip or rolled sides.</p> <ul style="list-style-type: none"> The transportation of dangerous goods will be by licenced carriers. 		Project Engineer
	Handling & Use	<p>Handling of products will be subject to the following requirements:</p> <p>Hazardous substances and dangerous goods will be clearly labelled</p> <p>Current MSDS (no older than 5 years) will be readily available when handling</p> <p>Controls stipulated in the MSDS to be applied when handling and using</p> <ul style="list-style-type: none"> Used oily rags, oil filters and other left over hydrocarbon and chemical products hall be stored in a designated area and removed by licensed carriers to either recycle or otherwise dispose of. 		All
	Refuelling	<ul style="list-style-type: none"> Refuelling of plant and vehicles must be monitored continually and conducted in designated areas away from sensitive receptors. All in field refuelling must have a spill kits available to contain and clean up any spills. All refuelling areas must be signed to prevent smoking or naked flame Vehicles must be switched off when refuelling and the use of mobile phones prohibited 		All

HSE Management Plan

Western Paddock Remediation



Appendix 4- Hydrocarbon and Chemical Management Sub Plan

Appendix 4- Hydrocarbon and Chemical Management Sub Plan		Responsibility
	<ul style="list-style-type: none"> Fixed refuelling areas must have a plastic lined refuelling area Fuel storage containers must be of a double bund construction 	
Site layout	<ul style="list-style-type: none"> Georgiou will develop a site plan (i.e. a diagram) showing the location of storage areas, spill kit locations, muster points, firefighting equipment and 1st aid equipment including eye wash/flush locations. This site plan must be current and displayed at the work site at all times throughout construction. In the event of an emergency that involves the need for emergency services this site plan along with a product manifest must be provided to the emergency services 	Project Manager
Storage of Hazardous Materials	<ul style="list-style-type: none"> Any Dangerous Goods and/or Hazardous Substance must be stored in designated areas compliant with statutory and industry codes of practice Quantities of hazardous materials should be kept to a minimum, commensurate with their usage and shelf life. Material Safety Data Sheets of stored hazardous materials will be readily accessible at the place of storage/site office. Permanent and temporary containers that hold hazardous materials must be labelled with the appropriate signage. The volume and types of hazardous materials stored must be known, current and documented and must not exceed the design capacity of the storage area. Storage and containment areas (including secondary containment) must be inspected for signs of loss or damage and any deficiencies must be addressed. These areas must be inspected at least weekly as part of the workplace inspection Hazardous materials no longer in use must be identified and assessed to determine if they should be removed from site. Hazardous materials storage areas must be kept clear of combustible material, vegetation and refuse by a minimum of three metres. 	All
Spill/Emergency Response	<p>In the event of a spill the following generic procedure must be followed,</p> <ol style="list-style-type: none"> Do not put yourself at risk. Notify personnel in the immediate area and remove yourself and others from danger. Report ALL SPILLS immediately to the Supervisor and HSE Advisor (report location, type and extent of incident) <p><10l is reported as a hazard >10l is reported as an incident</p>	All
Workplace	<ul style="list-style-type: none"> Hazardous Materials storage and use will be inspected weekly as part of workplace inspections & 	Supervisors

HSE Management Plan

Western Paddock Remediation



Appendix 4- Hydrocarbon and Chemical Management Sub Plan			Responsibility
	Inspections	within the DHI Environmental Inspections checklist.	
	Contaminated Sites	<ul style="list-style-type: none">▪ In the event that a Georgiou Site is deemed as contaminated by the State Regulatory Body, the Project Engineer will be advised by suitably qualified personnel on ongoing monitoring of the site for the duration of the works or as required.	Project Engineer
	Monthly (Documented)	<ul style="list-style-type: none">▪ Environmental inspections will be completed via ONEAPP	Supervisor
Reporting	HSEQ Monthly Management Meeting		Project Manager

Environmental Management Plan

Western Paddock Remediation



Appendix 5 - Flora & Fauna Management Sub Plan				Responsibility
Objectives and Targets	<ul style="list-style-type: none"> Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan) 			Project Manager
Performance Criteria	100% compliance with Client & legal requirements 100% achievement with Site Objectives & Targets			Project Manager
Mitigation Measures	General	<p>Vehicles, equipment, plant, materials and personnel are to remain within the designated construction area at all times and not breach established environmentally sensitive exclusion zones.</p> <ul style="list-style-type: none"> Workers will be informed of the Site specific controls required to minimise potential impacts and protect flora and fauna including: <ul style="list-style-type: none"> the requirement to work within the designated disturbance zones; requirement to recognise protected flora or fauna species identified to be found on the site; tree protection zones; Specific licence conditions applicable to the Site. 		All
	Training and Competency			Project Manager
	Fauna Endangered, Vulnerable and Near Threatened Animal Breeding Places	<ul style="list-style-type: none"> There is no known active breeding place for any Endangered, Vulnerable or Near Threatened fauna listed under the EPBC Act within the project boundary. <p>NOTE: Handling of any active animal breeding place is only permitted to be conducted by an authorised fauna handler operating under a current permit granted in accordance with legislative requirements.</p>		All
	Authorisation & Compliance	<ul style="list-style-type: none"> Georgiou will not clear vegetation without written permission from the Client, local Shire or relevant Regulatory Authority. All clearing works under a permit, approval or licence will be compliant with the conditions of permit, approvals or licence and within the predetermined area. In the event of any unauthorised clearing, works will cease immediately and the Project Manager, client will be notified. Unauthorised clearing of declared protected species or areas will be investigated in accordance with section 12.3. Work may only recommence following written confirmation from the Client. The Project Manager will be responsible for authorising the recommencement of works. 		Project Engineer
	Marking	<ul style="list-style-type: none"> The Project Engineer will ensure the area to be cleared is clearly marked (e.g. pegging) and areas of vegetation or trees nominated to be excluded from the clearing works are to be visually identifiable to all personnel involved in the works. The method of marking is to be communicated to all persons involved in the clearing process. All control measures are to be communicated to personnel involved in the tasks. 		All
Mitigation Measures	Flora	<ul style="list-style-type: none"> Flora that is to be protected will be clearly marked using a method that will not harm or damage. A Tree protection Zone (TPZ) is to be established for any trees on a construction site that are to be protected. This is to be fenced off or barricaded to ensure construction activities do not cause damage to the root plate of the tree. Native vegetation should be protected where reasonably possible. Large areas that are to be protected from Site works will be demarcated to prevent intrusion and disturbance. This requirement is to be communicated to personnel involved within the site area. When the pruning of trees is to be undertaken that are to be protected, it will be done by suitably 		All

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Appendix 5 - Flora & Fauna Management Sub Plan		Responsibility
	<p>qualified personnel only. Where branches are trimmed an assessment of the trees ability to survive should be conducted by a suitably qualified person and adequate area around the tree in accordance with AS4970:2009 Protection of trees of development sites.</p> <ul style="list-style-type: none"> Trees should be felled into the construction site or in slots between stands of trees, where practical, to minimise damage to other trees during the clearing process. Machinery contact with standing trees on vegetated margins is to be avoided. The clearing of vegetation outside the construction area will not be permitted except in the event of an emergency or as directed by emergency services. Cleared vegetation will be stockpiled on site and will not be intentionally burnt without the written consent of the Client or Local Authority. Where practicably possible, stockpiles of vegetation should be reused or recycled. Any disposal of vegetation to landfill will be conducted in consultation with the Client and in compliance with Waste Management Procedure. 	
Fauna	<ul style="list-style-type: none"> If fauna are confirmed to be present onsite during clearing, clearing works should proceed with care to enable the fauna to relocate freely. Clearing is to be conducted in a sequential manner and in a way that encourages escaping wildlife away from the activity into adjacent natural areas and not across roads or into other areas of threat (e.g. trench). 	All
Trenches	<ul style="list-style-type: none"> All open excavations and trenches will be visually inspected on a daily basis for trapped fauna. Surveillance must occur along the entire length of the trench or excavated area and not merely those areas described as fauna habitats or sensitive areas. Open trenches are to be checked for fauna immediately prior to backfill, and any trapped animals removed by authorised fauna handlers. The following measures are suitable to prevent fauna entrapment within any excavation or trench: <ul style="list-style-type: none"> - minimising the period of time the trench/excavation is open - providing slopped access and egress points every 30 meters - using pipe caps to prevent fauna from entering pipes - installing additional trench plugs at greater than normal frequencies in areas identified as known or potential wildlife habitat (e.g. native forest areas) 	All
Fauna Handling	<ul style="list-style-type: none"> Fauna will not be intentionally harmed or maimed under State wildlife protection legislation. This includes aquatic and terrestrial fauna (land and air animals). Workers are not authorised handle/to be in possession of native fauna. The trapping and handling of fauna, in particular dangerous species will only be undertaken by a competent, qualified fauna handler. All fatalities or injuries to fauna will be reported in accordance with the HSE Reporting and Investigation Procedure. 	All
Fire Management	<ul style="list-style-type: none"> Georgiou will not set fire to bush or use spark generating machinery (e.g. graders) during a prohibited or restricted burning time. If safe to do so, Georgiou will extinguish any bush fire within the site boundary and request help 	Project Manager

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Western Paddock Remediation



Appendix 5 - Flora & Fauna Management Sub Plan				Responsibility
			from authorities if necessary. Fire breaks will be established as requested by authorities.	
	Rehabilitation		MRA will advise Georgiou on the rehabilitation of flora & fauna requirements of the site area prior to site completion.	Project Manager
	Monthly (Documented)		<ul style="list-style-type: none"> Environmental inspections will be completed via ONEAPP 	Supervisor
Reporting	HSEQ Monthly Management Meeting			Project Manager

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Appendix 6 - Cultural & Heritage Management Sub Plan				Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)			Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets			Project Manager
Mitigation Measures	General	<ul style="list-style-type: none">Maintain the integrity of the cultural (European & Indigenous) aspects of the Site	Workers will be informed of any identified cultural or heritage aspects on the Site and any specific controls to be adhered including: <ul style="list-style-type: none">Management practices when working near protected areasRespecting Indigenous Heritage SitesReporting requirements	Project Manager
	Training and Competency			
	Approvals	It has been assessed by the client and it has been deemed that no approvals are required over the duration of the project.		Project Engineer
	Unexpected finds	<ul style="list-style-type: none">In the event that an artefact or remains are found:<ul style="list-style-type: none">The works in that area will cease immediatelyThe Project Manager and MRA must be notified;The site must be made secure, a buffer zone of ten meters is recommended;All work at the find location must cease;The site must be made secure, a buffer zone of ten meters is recommended;MRA to provide management recommendations.Georgiou will notify all site personnel of the object and/or area and proposed treatment of that object and/or area as soon as possible, but prior to commencing work on the next working day.Works will not continue until written approval has been received from the client.		All
Reporting	Monthly (Documented)	Environmental inspections will be completed via ONEAPP		Supervisor
	HSEQ Monthly Management Meeting			Project Manager

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Appendix 7- Soil/Materials Management Sub Plan				Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)			Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets			Project Manager
	Training and Competency	<ul style="list-style-type: none"> Workers will be informed of the Site specific controls required for soil management. 		Project Manager
	Approvals	<ul style="list-style-type: none"> Stockpile locations are to be confirmed with the MRA prior to use. Georgiou will not commence any ground disturbance activity without a valid Ground Disturbance Permit (GDP) and the implementation of controls as specified within the GDP. 		Project Engineer
	Top Soil Management	<ul style="list-style-type: none"> Top soil will not be stripped and stockpiled in wet conditions if possible. This is to maintain the integrity and quality of the soil. All stockpiles will be surveyed and information will be recorded such as quantities, source coordinates and date stripped Top soil stock piles will be constructed to minimise soil loss from run-off and prevent erosion Top soils contaminated with weeds will be placed/located separately from clean stock piles. To minimise airborne dust from top soil stockpiles, non-saline water will be applied to stabilise the surface. Surfaces will be checked to ensure crusting does not inhibit seed germination, which also serves to reduce wind erosion. 		Project Engineer
	Erosion and Sediment Controls	<ul style="list-style-type: none"> Consideration will be given to the following when developing ESC plans: <ul style="list-style-type: none"> Seasonal conditions; Soil types, particularly dispersive soils, sodic and saline soils; Local hydrology affecting the worksite; and Local drainage, including temporary and overland flow paths. The accepted methods of control are as follows but not limited to: <ul style="list-style-type: none"> Minimising clearing; Minimise duration of soil exposure; Early installation of drainage and erosion and sediment control measures; Protection of exposed soil surfaces from erosion (by application of dust suppressants, geofabric, jute mesh, mulch or seeding where practicable); Onsite capture of sediment; Regular auditing of erosion and sediment controls on site, including post rainfall inspections; Progressive stabilisation and revegetation of disturbed areas. Any runoff from site will comply with the State's water quality parameters. 		Project Manager

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Appendix 7- Soil/Materials Management Sub Plan			Responsibility
	Monthly (Documented)	<ul style="list-style-type: none">▪ Environmental inspections will be completed via ONEAPP	Supervisor
Reporting	HSEQ Monthly Management Meeting		Project Manager

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Appendix 8- Air Quality & Dust Management Sub Plan			Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)		Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets		Project Manager
Mitigation Measures	General	Site related dust, identifiable fumes, odours and vapours will not infringe beyond site boundaries where practical This Sub Plan is deemed to be compliant with section 2.7 of the RFT document.	Project Manager
	Training and Competency	<ul style="list-style-type: none"> As part of the Site Induction, workers will be informed of the Site specific controls required for air quality and dust management including: <ul style="list-style-type: none"> - Correct use of PPE - Use of monitoring equipment - Methods to control dust 	Project Manager
	Greenhouse Gases	<ul style="list-style-type: none"> Regular maintenance of plant and equipment for optimum performance will be undertaken to keep emissions to a minimum and increase plant productivity. Maintenance of Plant and equipment will be in accordance with the Plant, Equipment and Vehicle Maintenance Procedure Vehicles and equipment must be fitted with appropriate emission control equipment and routinely maintained. Plant should be switched off when not in use, wherever practicable All plant, equipment and vehicles are to be regularly monitored and maintained and records kept of maintenance. Engine tampering to increase power output is prohibited Air emissions from plant, vehicles and equipment should be visually monitored throughout construction 	Project Manager
	Dark Smoke	<ul style="list-style-type: none"> All internal combustion engines will be regularly serviced to ensure optimum operation and minimise the volume of visible smoke emitted. Any Plant or light vehicles emitting unreasonable smoke (concentrations higher than normal operation) will cease operation and be serviced by a trained and qualified technician. Materials on site will not be burned intentionally without consulting and obtaining the authorisation of the relevant Local Shire, Fire Authority and Client. The burning of any material on site should be a last option after alternative methods have been considered. 	All
	Dust Monitoring	<p>The following dust monitoring methods will be applied on the Site:</p> <ul style="list-style-type: none"> Obtaining weather reports from the Bureau of Meteorology (BOM) website Visual inspection Dust monitors MRA will conduct PM10 dust monitoring and provide results and alarms to Georgiou for management action in accordance with alarm levels specified in the environmental specification. 	Project Engineer
	Contingency measures	Please refer to appendix 1A for contingency measures	Project Manager
	Dust Control	Dust control methods to be applied on the site to keep dust generated within the site boundaries, as	All

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Appendix 8- Air Quality & Dust Management Sub Plan			Responsibility
		<p>reasonably practicable, will be:</p> <ul style="list-style-type: none"> - Application of water/dust suppressant via water carts - Hydro mulching to stabilise soils - Physical application of ground cover - Cessation of works in adverse weather conditions - Restricted speed limits on site - Reschedule dust generating activities to avoid adverse weather conditions - Communicate dust risk and mitigation measures to staff prior to commencing work - Wheel Wash for all vehicles exiting the project area - Periodic street sweeping if required 	
	Fumes, Odours and Vapours	<ul style="list-style-type: none"> ▪ The Site will endeavour to keep the generation of emission of unreasonable levels of fumes, odours and vapours to a minimum. Refer to the Waste Management Sub Plan and Hydrocarbon and Chemical Environmental Management Sub Plan which detail storage and handling controls that minimise fumes, odours and vapours. 	All
	Monthly (Documented)	<ul style="list-style-type: none"> ▪ Environmental inspections will be completed via ONEAPP 	Supervisor
Reporting	HSEQ Monthly Management Meeting		Project Manager

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Appendix 9- Noise and Vibration Management Sub Plan				Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)			Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets			Project Manager
Mitigation Measures	General	<ul style="list-style-type: none">Compaction activities that have the potential to impact external stakeholders will consider:<ul style="list-style-type: none">- Letter drops to local residents- Static rolling- Oscillating compaction systems- Reduced amplitude settings- Pre & During Construction noise MonitoringExcessive noise hazard areas will be demarcated and adequately signed and entry only permitted to these areas when the required PPE is wornTask rotation may be employed where practicable and when carrying out long tasks		Project Manager
	Training and Competency	<ul style="list-style-type: none">As part of the Site Induction, workers will be informed of the site specific controls required for noise and vibration management including:<ul style="list-style-type: none">- Correct use of PPE- Pre-construction & During Construction Noise Monitoring		
	Hours of Operation	<ul style="list-style-type: none">Construction work in residential areas will only be conducted between the hours of 7 am and 7 pm (WA) on days other than Sundays and public holidaysWork outside of these hours will require permission from the local government authority.		Project Manager
	Plant, Equipment & Vehicles	<ul style="list-style-type: none">Plant will be fitted with appropriate noise emission/vibration control equipmentPlant will be fitted with adequate seat suspensionPlant should be switched off when not in use, wherever practicableTasks using equipment that causes vibration to hands will be rotated at intervals to reduce exposureConsideration may be given to the use of anti-vibration PPEAll plant, equipment and vehicles are to be regularly monitored and maintained and records kept of maintenanceAny abnormalities in expected noise or vibration emissions will be recorded in the plant's log book and reported to the plant department.		Plant Department
	Monitoring	<ul style="list-style-type: none">Where there is a potential for noise/vibration to effect external stakeholders the site will consider the use of onsite monitors		Project Engineer
	Monthly (Documented)	<ul style="list-style-type: none">Environmental inspections will be completed via ONEAPP		Supervisor
	Reporting	HSEQ Monthly Management Meeting		

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Appendix 10 - Weed, Pest and Disease Management Sub Plan				Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)			Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & Targets			Project Manager
Mitigation Measures	Training and Competency	<ul style="list-style-type: none"> Workers will be informed of the Site specific controls required for weed, pest and disease management including: <ul style="list-style-type: none"> pre-starts in weed and pest affected areas; location of weed infested areas to be avoided; Identification of weeds and pests & their associated classification. Pest control operators are to have qualifications. Where possible the preferred method of removal is by mechanical means where they will then be stockpiled separately from other non-infested topsoil/vegetation, removed from site and destroyed. Contact your local Shire for additional weed management strategies applicable to individual weed species. In the event that weeds are to be removed by chemical means Georgiou will contact the relevant local council to engage a qualified pest control operator. Qualifications will be obtained prior to commencing works onsite. If required flagging to be used and location communicated to personnel for avoidance. 		Project Manager
	Weed control measures	<ul style="list-style-type: none"> If feral species/vermin are identified within the Site boundary Georgiou in consultation with the MRA may consider and propose measures to the control of feral animal movements along newly cleared construction areas which provide new access to sensitive environments. 		Supervisor
	Feral Species/Vermin	<ul style="list-style-type: none"> Environmental inspections will be completed via ONEAPP 		Supervisor
	Monthly (Documented)	HSEQ Monthly Management Meeting		Project Manager
	Reporting			

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Georgiou

Appendix 11- Fire Prevention & Management Sub Plan				Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)			Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets			Project Manager
Mitigation Measures	General	<ul style="list-style-type: none"> As part of the Site Induction, workers will be informed of the Site specific controls required for fire management. Emergency Management Team members will be provided training to respond to a fire Areas within 3 metres of where dangerous goods are stored will be free from combustible materials. 		Project Manager
	Fire Prevention			All
	Monitoring of Prohibited & restricted Burning Times	<ul style="list-style-type: none"> The Project will monitor prohibited and restricted burning times during the life of the project. Prohibited and restrictive burning times will be communicated at Prestart. 		Site Engineer
	Fire Management	<p>Georgiou will not dispose of cigarettes/matches or similar during a prohibited or restricted burning time from a vehicle or in circumstances likely to set fire to the bush.</p> <p>If safe to do so, Georgiou will extinguish any bush fire within the site boundary and request help from authorities if necessary. Fire breaks will be established as requested by authorities.</p> <p>Incendiary material (hot/burning ash, furnace refuse or similar) are not authorised to be carried in a vehicle unless it is totally enclosed in a metal container. Georgiou will also comply with directions of authorities when carrying this material. Such material will only be disposed with approval of authorities.</p>		Project Manager
	Bulldozers and graders requirements in restricted or prohibited burning times	<p>Bulldozers or road-graders will not be operated during the prohibited burning times or restricted burning times unless-</p> <ul style="list-style-type: none"> a fire extinguisher is carried on the bulldozer or grader the exhaust pipe is vertical and the exhaust system, including pipes is maintained in a sound and efficient condition exhaust pipe is fitted with an efficient spark arrester which is of suitable design for the type of bulldozer or road-grader to which it is attached and is maintained in a clean, sound and efficient condition at all times when the bulldozer or road-grader is in operation during the prohibited burning times or the restricted burning times. 		Supervisor
	Welding apparatus & power operated abrasive cutting discs requirements in the open air	<ul style="list-style-type: none"> The use of welding and power operated abrasive cutting discs of any kind, in the open air, will be prohibited on site unless at least one fire extinguisher is provided at the place where the welding or cutting operation is carried out; and the work area is surrounded by a firebreak which is at least 5 m wide. 		All

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Appendix 11- Fire Prevention & Management Sub Plan			Responsibility
		<ul style="list-style-type: none">Hot Work Permits are only issued during total fire bans where permits from the Fire Authority have been first obtained.	
	Monthly (Documented)	<ul style="list-style-type: none">Environmental inspections will be completed via ONEAPP	Supervisor
Reporting	HSEQ Monthly Management Meeting		Project Manager

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Appendix 12- Acid Sulphate Soils & Dewatering Management Sub Plan				Responsibility
Objectives & Targets	▪ Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)			
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Project Objectives & targets			
	General	▪ Workers will be informed of the Site specific controls required for Acid Sulphate Soils & Dewatering Management.		Project Manager
Mitigation Measures	Project Planning	▪ Acid Sulphate Soils have not been identified on site. In the event that Acid Sulphate Soils are encountered, works will cease and an Acid Sulphate Soils and Dewatering Management Plan will be developed to set out how Acid Sulphates Soils will be managed.		Project Manager
	Monthly (Documented)	▪ Environmental inspections will be completed via ONEAPP		Supervisor
Reporting	HSEQ Monthly Management Meeting			Project Manager

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Appendix 13a - Non-Friable Asbestos Management Sub Plan				Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)			Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets			Project Manager
	Planning	<p>If non-friable Asbestos is identified on site it will be managed as follows:</p> <ul style="list-style-type: none"> Areas containing non-friable asbestos will be quarantined, including from the public and communicated to all persons working on a site An asbestos register will be maintained in the Site's Master Safety Register and be readily accessible to all personnel who carry out or intend to carry out work <p>This Asbestos Register will record:</p> <ul style="list-style-type: none"> identified non-friable asbestos in the workplace the date the non-friable asbestos was identified the location and condition of the asbestos 		Project Manager
	Training and inductions	<p>As part of the Site Induction, workers will be informed of the Site specific controls required for management non-friable asbestos in soil:</p> <ul style="list-style-type: none"> Site access restrictions Correct use of PPE Decontamination procedures Use of monitoring equipment Waste handling procedures <p>Dust control measures and performance measures</p>		HSE Advisor
	Access Restrictions	<ul style="list-style-type: none"> Signs and barriers will be erected to warn of the danger and to prevent unauthorised people entering areas where asbestos contaminated fill material is being excavated/ handled. The location and extent of any access control areas will be agreed in discussion between the Project Manager, Project Engineer, HSE Advisor and the Environmental Coordinator and will be established in accordance with NOHSC:2002 (2005) Code of Practice for the Safe Removal of Asbestos (2nd Ed.) guidelines. Potential entry points to the asbestos work area should be signposted or labelled in accordance with AS 1319 (1994) Safety Signs for the Occupational Environment and NOHSC: 2002 (2005b). 		Project Manager
	Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> Only personnel with appropriate personal protective equipment (PPE) and training will be allowed to work inside the asbestos work area. In addition to hard hats, safety boots, safety glasses and hearing protection, the minimum protective equipment worn for personnel will be disposable overalls, gloves and a powered air-purifying respirator. The filter type within the respirator should be Class P2, as stipulated in the Code of Practice for 		Project Manager

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Appendix 13a - Non-Friable Asbestos Management Sub Plan				Responsibility
		<ul style="list-style-type: none">the Safe Removal of Asbestos (NOHSC, 2005).Heavy vehicle and excavation equipment will be fitted with air-conditioned cabins. Where this is not possible, operators will be required to wear PPE as specified above.All contaminated materials, including cleaning rags, plastic sheeting and PPE etc, must be disposed of as asbestos waste (NOHSC, 2005).All soils and waste, will be disposed of by a licenced sub-contractor at an appropriately licenced landfill with requirements of the Waste Management Sub Plan and Materials Tracking System implemented (see Appendix 2).		Project Manager
	Decontamination			Project Manager
	Waste Management			Project Manager
		Dust control measures are required to conform to DER guidelines (DEC, 2011) which include the following measures: <ul style="list-style-type: none">Movement of excavated soil will be minimised to prevent dust generation and maintained under damp conditions.Earthworks will be undertaken in stages to avoid the creation of large areas of disturbance, which represent a source of dust emissions.Water carts will be available.Watering will be conducted using water trucks and impulse sprinklers may also be considered as required. Watering will be conducted at the following areas:<ul style="list-style-type: none">Sites undergoing excavations.In areas being excavated / remediated, the application of water will be controlled to prevent ponding or run-off occurring.Uncovered, short-term stockpiles.On all internal access tracks and machinery storage areas.Regular maintenance checks of dust suppression equipment will be conducted to ensure effective operation.Internal access tracks will be hard surfaced and appropriate speed limits will be imposed to reduce dust generation.Internal tracks will be wetted down to minimise dust generation in transport areas. Water will be applied to the access tracks in the morning prior to each day or activity. Additional water will be applied to the tracks throughout the day, as required.MRA will conduct PM10 dust monitoring and provide results and alarms to Georgiou for management action in accordance with alarm levels specified in the environmental specification.		Project Manager
	Dust Control			Project Manager

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Appendix 13a - Non-Friable Asbestos Management Sub Plan			Responsibility
	(Indicative of a short period of elevated dust emissions that if allowed to persist may result in exceedances of the statutory particulate criteria)		<ul style="list-style-type: none"> mobile phone Site supervisor to immediately evaluate conditions and implement contingency measures as specified in the agreed Dust Management Plan
	24 hour average Corrective Action Alert. (Indicative of prolonged periods of dust emission that may result in exceedances of the statutory particulate criteria)	40	<ul style="list-style-type: none"> Alarm notification sent to Contractor's site supervisor's mobile phone Site supervisor to immediately evaluate conditions and implement contingency measures
	1 hour average Alarm (Indicative of a short period of elevated dust emissions that if allowed to persist will almost certainly result in exceedances of the statutory particulate criteria)	1000	<ul style="list-style-type: none"> In addition to SMS alarm to the site supervisor, SMS is also sent to the site environmental superintendent who will require immediate action to control dust or cessation of work. If condition persists for more than 3 hours, then work to cease on site
	24 hour average Alarm (Indicative of prolonged periods of dust emission that will almost certainly result in exceedances of the statutory particulate criteria)	50	<ul style="list-style-type: none"> In addition to SMS alarm to the Contractor's site supervisor, SMS is also sent to the environmental superintendent who will require immediate action to control dust or cessation of work. Dust controls for the site to be re-evaluated and upgraded as required to prevent a

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Appendix 13a - Non-Friable Asbestos Management Sub Plan				Responsibility							
			recurrence								
	Stockpile Contingency Measures	<p>Non-friable asbestos impacted waste will be excavated, stockpiled on plastic lining, tested and then placed into trucks and removed from the Site.</p> <p>In order to reduce potential impacts of stockpiles on surface water quality, all stockpiles will be placed at least 30m from surface water.</p> <ul style="list-style-type: none">Any temporary stockpiles of non-friable asbestos contaminated soil will be maintained under moist conditions.Stockpiled material will be disposed of off-site in accordance with the Landfill Waste Classification and Waste Definitions 1996 (as amended 2009) (DEC, 2009).In order to confirm that all contaminated soil has been removed, validation sampling beneath 'small' stockpiles (<20m3) will comprise one composite sample analysed for asbestos. Validation sampling beneath stockpiles of greater volume will be dictated by the footprint area of the stockpile and sampled in accordance with DER guidelines using systematic grid sampling strategy for asbestos.Validation samples from beneath stockpiles will be analysed for asbestos and compared against the nominated validation criteria.	Project Manager								
	Air Monitoring	<ul style="list-style-type: none">The applicable standards for monitoring asbestos are provided in Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres (NOHSC, 2005b), the Code of Practice for the Safe Removal of Asbestos (NOHSC, 2005a) and the Occupational Safety and Health Regulations 1996. The National Exposure Standard (NES) as established by the Australian Safety and Compensation Council (ASCC, formerly the NOHSC) is 0.01 fibres/mL of air measured using the membrane filter method for all forms of asbestos.Personnel MonitoringAirborne asbestos fibres will be monitored using personal air samplers at a number of locations within the excavation / subsurface disturbance area.The personal air samplers will be used in consultation with occupational testing procedures and sampling will operate on an 8hr cycle (8am-4pm) with samples being processed at an appropriately accredited laboratory on a 24hr/next working day turnaround. The results of this sampling will be used to determine compliance with asbestos exposure standards.The following 'Control Levels' will be adopted for the Project for personnel air monitoring for asbestos:<table><tr><td>Control Level (fibres/mL)</td><td>Control Action (fibres/mL)</td></tr><tr><td><0.01</td><td>Continue with adopted control measures</td></tr><tr><td>≥0.01</td><td>Review control measures</td></tr><tr><td>≥0.02</td><td>Stop subsurface disturbance works and find the cause</td></tr></table>	Control Level (fibres/mL)	Control Action (fibres/mL)	<0.01	Continue with adopted control measures	≥0.01	Review control measures	≥0.02	Stop subsurface disturbance works and find the cause	Project Manager
Control Level (fibres/mL)	Control Action (fibres/mL)										
<0.01	Continue with adopted control measures										
≥0.01	Review control measures										
≥0.02	Stop subsurface disturbance works and find the cause										

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Appendix 13a - Non-Friable Asbestos Management Sub Plan		Responsibility				
	<ul style="list-style-type: none">▪ Static Air Samplers<ul style="list-style-type: none">- Static air samplers will be strategically located on the boundaries of the work area to assess the effectiveness of controls within the excavation area.- Asbestos will be measured in accordance with the NOHSC's Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres (NOHSC, 2006) for the determination of airborne fibres.- In terms of protecting public health, the target background level within the three static air samplers will be the NATA collection and detection limit of 0.01 fibres/mL (10 times below the occupational limit). It is proposed that excavation work will cease while dust management procedures are reviewed if this target criteria is exceeded.- The static air monitors will operate on a 8hr cycle (8am-4pm) with samples being processed at an appropriately accredited laboratory on a 24hr/next working day turnaround. The results of this sampling will be used to determine compliance with asbestos exposure standards.- The following 'Control Levels' will be adopted for the Project for static air monitoring asbestos:<table><tr><th>Control Level (fibres/mL)</th><th>Work Stoppage Criterion (fibres/mL)</th></tr><tr><td><0.01</td><td>0.01</td></tr></table>▪ If for any reason static samples / personal monitoring samples fail to reach the laboratory in time, then samples will be analysed on a 48hr/two working day turnaround. The reason for failure to deliver the samples on the day will be required to be reported within 24hrs of becoming aware of the event.Once all subsurface excavation works have been completed, sampling for fugitive asbestos fibres will cease.	Control Level (fibres/mL)	Work Stoppage Criterion (fibres/mL)	<0.01	0.01	
Control Level (fibres/mL)	Work Stoppage Criterion (fibres/mL)					
<0.01	0.01					
Environmental Inspections & Monitoring	Daily (Documented)	Monitoring Carried out by the Environmental Consultant Project Manager				
	Weekly (Documented)	Monitoring Carried out by the Environmental Consultant Project Manager				
	Monthly (Documented)	DHI Environmental Inspection Carried out via OneApp Project Manager				
Reporting	HSEQ Monthly Management Meeting Project Manager					

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Western Paddock Remediation



Appendix 13b - Friable Asbestos Management Sub Plan			Responsibility
Objectives & Targets	▪ Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)		Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets		Project Manager
Management Measures		If Friable Asbestos is been identified by the site air monitors or visually on site it will be managed as follows: <ul style="list-style-type: none">▪ Areas containing Friable Asbestos will be quarantined, including from the public and communicated to all persons working on a site▪ The Project Manager or delegate will consult/engage an appropriately licensed asbestos removalist to remove the asbestos from site in a lawful manner▪ An asbestos register will be maintained in the Site’s Master Safety Register and be readily accessible to all personnel who carry out or intend to carry out work	Project Manager
	Planning	This Asbestos Register will record: <ul style="list-style-type: none">▪ identified friable asbestos in the workplace▪ the date the friable asbestos was identified▪ the location of the friable asbestos <p>Only workers holding an unrestricted asbestos licence may carry out asbestos removal.</p> <ul style="list-style-type: none">▪ Unrestricted: Allows people to remove all forms of asbestos (friable and non-friable) and replaces the current asbestos removal licence.	HSE Advisor
	Training and inductions	As part of the Site Induction, workers will be informed of the Site specific controls required for management asbestos in soil: <ul style="list-style-type: none">- Site access restrictions- Correct use of PPE- Decontamination procedures- Use of monitoring equipment- Waste handling procedures Dust control measures and performance measures	
	Access Restrictions	▪ Signs and barriers will be erected to warn of the danger and to prevent unauthorised people entering areas where friable asbestos contaminated fill material is being excavated/ handled.	Project Manager

HSE Management Plan

Western Paddock Remediation

Georgiou

Appendix 13b – Friable Asbestos Management Sub Plan		Responsibility
	<ul style="list-style-type: none"> The location and extent of any access control areas will be agreed in discussion between the Project Manager, Project Engineer, HSE Advisor and the Environmental Coordinator and will be established in accordance with NOHSC:2002 (2005) Code of Practice for the Safe Removal of Asbestos (2nd Ed.) guidelines. Potential entry points to the friable asbestos work area should be signposted or labelled in accordance with AS 1319 (1994) Safety Signs for the Occupational Environment and NOHSC: 2002 (2005b). 	
Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> Only personnel with appropriate personal protective equipment (PPE) and training will be allowed to work inside the friable asbestos work area. In addition to hard hats, safety boots, safety glasses and hearing protection, the minimum protective equipment worn for personnel will be disposable overalls, gloves and a powered air-purifying respirator. The filter type within the respirator should be Class P2, as stipulated in the Code of Practice for the Safe Removal of Asbestos (NOHSC, 2005). Heavy vehicle and excavation equipment will be fitted with air-conditioned cabins with HEPA filters to mitigate dust exposure of operators. Where this is not possible, operators will be required to wear PPE as specified above. 	Project Manager
Decontamination	<ul style="list-style-type: none"> All contaminated materials, including cleaning rags, plastic sheeting and PPE etc, must be disposed of as asbestos waste (NOHSC, 2005). The following procedures (based on Code of Practice for the Safe Removal of Asbestos (NOHSC, 2005)) will be implemented: Tools and Equipment <ul style="list-style-type: none"> At the end of removal work, all tools should be decontaminated in the following manner: decontaminated using wet or dry decontamination methods as outlined in the NOHSC (2005a) Code of Practice for the Safe Removal of Asbestos i.e. fully dismantled and cleaned under controlled conditions; or placed in sealed containers (and used only for asbestos removal work); or disposed of as asbestos waste. If tools cannot be decontaminated within the asbestos work area, or are to be re-used on another project, they should be tagged to indicate possible contamination and double bagged in asbestos waste bags before being removed from the asbestos work area. Personal Decontamination <ul style="list-style-type: none"> Personal decontamination must be undertaken each time employees leave the asbestos work area 	Project Manager

HSE Management Plan

Western Paddock Remediation

Georgiou

Appendix 13b – Friable Asbestos Management Sub Plan

Appendix 13b – Friable Asbestos Management Sub Plan		Responsibility
	<p>(NOHSC, 2005). This should occur within the asbestos work area so as to not transport material off-site, but should be located within an area where re-contamination is minimised.</p> <ul style="list-style-type: none"> - Throughout the asbestos removal process, asbestos contaminated PPE should not be transported outside the asbestos work area except for disposal purposes. - Before work clothes and footwear worn during asbestos work are removed from the work area, they should be thoroughly vacuumed with an asbestos vacuum cleaner to remove any asbestos fibres, and footwear should be wet wiped. ▪ Personal respiratory protective equipment should continue to be worn until all contaminated disposable coveralls and clothing has been removed and bagged for disposal; and personal washing completed. ▪ Vehicles exiting the project area via a wheel wash to ensure the vehicle is clean ▪ No excess spoil transferred into the coppershop road area where periodic sweepers may be employed if required 	
Waste Management	<ul style="list-style-type: none"> ▪ Any waste bags, skips, or vehicle trays used to store and/or transport potentially asbestos containing material (i.e. disposable PPE) will be appropriately labelled advising handlers of the nature of the contents. Transport of asbestos must be undertaken in accordance with the Environmental Protection (Controlled Waste) Regulations 2004. ▪ All soils and waste, which cannot be accommodated onsite, will be disposed of by a licenced sub-contractor at an appropriately licenced landfill with requirements of the Waste Management Sub Plan and Materials Tracking System implemented (see Appendix 2). 	Project Manager
Dust Control	<p>Dust control measures are required to conform to DER guidelines (DEC, 2011) which include the following measures:</p> <ul style="list-style-type: none"> ▪ Movement of excavated soil will be minimised to prevent dust generation and maintained under damp conditions. ▪ Earthworks will be undertaken in stages to avoid the creation of large areas of disturbance, which represent a source of dust emissions. ▪ Water carts will be available. ▪ Watering will be conducted using water trucks and impulse sprinklers may also be considered as required. Watering will be conducted at the following areas: <ul style="list-style-type: none"> - Sites undergoing excavations. - In areas being excavated / remediated, the application of water will be controlled to prevent ponding or run-off occurring. 	Project Manager

HSE Management Plan

Western Paddock Remediation



Appendix 13b – Friable Asbestos Management Sub Plan		Responsibility
	<ul style="list-style-type: none"> - Uncovered, short-term stockpiles. - On all internal access tracks and machinery storage areas. - Regular maintenance checks of dust suppression equipment will be conducted to ensure effective operation. ▪ Internal access tracks will be hard surfaced and appropriate speed limits will be imposed to reduce dust generation. ▪ Internal tracks will be wetted down to minimise dust generation in transport areas. Water will be applied to the access tracks in the morning prior to each day or activity. Additional water will be applied to the tracks throughout the day, as required. 	
Contingency Response	Please refer to appendix 13a for contingency measures	Project Manager
Stockpile Contingency Measures	<p>Friable asbestos impacted waste will be excavated, Stockpiled on plastic, tested and then placed into trucks and removed from the Site.</p> <ul style="list-style-type: none"> ▪ In order to reduce potential impacts of stockpiles on surface water quality, all stockpiles will be placed at least 30m from surface water. ▪ All stockpiles will be plastic lined to contain soil or surface run-off. ▪ Any temporary stockpiles of asbestos contaminated soil will be maintained under moist conditions. ▪ Stockpiled material will be disposed of off-site in accordance with the Landfill Waste Classification and Waste Definitions 1996 (as amended 2009) (DEC, 2009). ▪ In order to confirm that all contaminated soil has been removed, validation sampling beneath 'small' stockpiles (<20m³) will comprise one composite sample analysed for asbestos. Validation sampling beneath stockpiles of greater volume will be dictated by the footprint area of the stockpile and sampled in accordance with DER guidelines using systematic grid sampling strategy for asbestos. ▪ Validation samples from beneath stockpiles will be analysed for asbestos and compared against the nominated validation criteria. 	Project Manager
Air Monitoring	<ul style="list-style-type: none"> - The applicable standards for monitoring asbestos are provided in Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres (NOHSC, 2005b), the Code of Practice for the Safe Removal of Asbestos (NOHSC, 2005a) and the Occupational Safety and Health Regulations 1996. The National Exposure Standard (NES) as established by the Australian Safety and Compensation Council (ASCC, formerly the NOHSC) is 0.01 fibres/mL of air measured using the membrane filter method for all forms of asbestos. 	Project Manager

HSE Management Plan

Western Paddock Remediation



Appendix 13b – Friable Asbestos Management Sub Plan				Responsibility
		<div> <div><0.01</div> <div>0.01</div> </div>	<ul style="list-style-type: none"> If for any reason static samples / personal monitoring samples fail to reach the laboratory in time, then samples will be analysed on a 48hr/two working day turnaround. The reason for failure to deliver the samples on the day will be required to be reported within 24hrs of becoming aware of the event. <p>Once all subsurface excavation works have been completed, sampling for fugitive asbestos fibres will cease.</p>	
Environmental Inspections & Monitoring	Daily (Documented)		<ul style="list-style-type: none"> Monitoring Carried out by the Environmental Consultant 	Project Manager
	Weekly (Documented)		<ul style="list-style-type: none"> Monitoring Carried out by the Environmental Consultant 	Project Manager
	Monthly (Documented)		<ul style="list-style-type: none"> DHI Environmental Inspection Carried out via OneApp 	Project Manager
Reporting	HSEQ Monthly Management Meeting			Project Manager



Follow Up Suitability Audit
of
Georgiou Group
Health, Safety & Environmental Management Plan

Western Paddock Remediation

June 2015

Prepared by
Guy LeNoir
Phone: (08) 9295 0311
Fax: (08) 9295 0322
Email: admin@switchedontosafety.com

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Introduction

SOS-Switched onto Safety was engaged to conduct an Occupational Safety and Health Suitability Audit of Georgiou Group's Health, Safety and Environmental Management Plan Version 1.0 (HSEMP) in relation to the works at Western Paddock Remediation.

Scope

To assess the HSEMP for the contracted works, detailing the practices and procedures for effective compliance with contractual and process requirements, which apply during the term of the contract.

Methodology

Assessment was by way of reviewing each of the sections of the Health and Safety Management Plan.

Reference Documents

WA Occupational Safety and Health Act 1984.

WA Occupational Safety and Health Regulations 1996.

AS/NZS ISO 4801 Occupational Health and Safety Management Systems.

Part B Schedule of Amendments to the General Conditions

Conclusion

It is the opinion of the Auditor that the submitted HSEMP be acknowledged as suitable for use.

Yours in safety and health,



Guy LeNoir

Principal Safety Consultant.

Work Safe Plan Assessor Number: 048

5th June 2015

Disclaimer:

While every effort has been made to accurately describe the information/findings contained within this document, data was obtained from sources beyond our direct supervision. We cannot make any assertions as to its reliability or completeness; therefore, the user may rely on it only at the user's risk. Since we cannot anticipate or control the conditions under which the information/findings may be used, we make no guarantee that the recommendations that have been suggested will be adequate for all individuals and/or situations. It is the obligation of the end user to comply with the requirements of all applicable laws related to the information/findings. No warranty, either expressed or implied, or liability of any nature with respect to the information/findings herein is made or incurred hereunder.

AS/NZS 4801:2001 Suitability Audit Checklist

Requirement	Compliance		Improvement/Comments
	Yes	No	
4.2 OHS Policy			
Has the organisation generated an occupational health and safety policy?	✓		HSEMP 3.1 Policy (includes link to H&S Policy on Georgiou Group website)
Appropriate to the nature and scale of the organisation's risks?	✓		Policy reviewed on web site.
Includes a commitment to establish measurable objectives and targets to ensure continued improvement aimed at eliminating work-related injury and illness?	✓		Satisfactory
Includes a commitment to comply with relevant OHS legislation and with other requirements placed upon the organisation or to which the organisation subscribes?	✓		Satisfactory.
Is documented, implemented, maintained and communicated to all employees?	✓		HSEMP 3.0 Policy, Objectives and Targets (including subheadings)
Is available to interested parties?	✓		H&S Policy available on Georgiou Group website
Is reviewed periodically to ensure it remains relevant and appropriate to the organisation?	✓		HSEMP 1.1 Amendments and Authorisation. HSEMP 3.1 Policy. NOTE: Policy currently being reviewed.
4.3 Planning			
Has the organisation established, implemented and maintained documented procedures for hazard identification, hazard/risk assessment and control of hazards/risks of activities, products and services over which an organisation has control or influence, including activities, products and services of contractors and suppliers?	✓		HSEMP 7 Hazard Identification and Risk Control (Including sub headings) HSEMP Health & Safety Hazard Management 8 – 8.17
Has the organisation developed its methodology for hazard identification, hazard/risk assessment and control of hazards/risks, based on its operational experience and its commitment to eliminate workplace illness and injury?	✓		HSEMP 7.4 Operational Control (including sub headings) HSEMP Health & Safety Hazard Management. 8 – 8.18
Is the methodology kept up to date?	✓		HSEMP 7.3 Review of Risks

AS/NZS 4801:2001 Suitability Audit Checklist

Requirements	Compliance		Improvements/Comments
	Yes	No	
Legal and Other Requirements Has the organisation established, implemented and maintained procedures to identify and have access to all legal and other requirements that are directly applicable to the OHS issues related to its activities, products or services, including relevant relationships with contractors or suppliers?	✓		HSEMP 4 Legal and other obligations. (including sub headings)
Is this information kept up to date?	✓		HSEMP 4.5 Availability of Statutory and Other Information.
Is this information communicated to employees?	✓		Communicated via an Induction, Prestart and Toolbox meetings
Objectives and Targets Has the organisation established, implemented and maintained documented OHS objectives and targets, at each relevant function and level within the organisation?	✓		HSEMP 3.0 Policy, Objectives and Targets. Site Objectives and Targets
Has the organisation considered its legal and other requirements, its hazards and risks, its technological options etc.?	✓		
Are the objectives and targets consistent with the OHS policy including the commitment to measuring and improving OHS performance?	✓		
OHS Management Plans Has the organisation established, implemented and maintained plans for achieving its objectives and targets?	✓		HSEMP ID Code: 1552-HSE-MP-001-01 has been provided. To be confirmed onsite.
Are responsibilities for achieving objectives, targets, relevant functions and levels of the organisation defined?	✓		HSEMP 5. Structure and Responsibilities (including subheadings) Site Objectives and Targets.
Are the means and timeframe by which objectives and targets are to be achieved defined?	✓		Site Objectives and Targets
Are procedures available that ensure current plans are reviewed and changes addressed as required?	✓		HSEMP 1.1 Amendments and Authorisation. HSEMP 16.2 Site Monthly HSEQ Management Meetings HSEMP 17 Auditing, Reviews and Inspections (including subheadings)

AS/NZS 4801:2001 Suitability Audit Checklist

Requirements	Compliance		Improvements/Comments
	Yes	No	
4.4 Structure and Responsibility Has the organisation's management identified and provided the resources required to implement, maintain and improve their OHSMS?	✓		HSEMP 5 Structure and Responsibilities (including sub headings) HSEMP 17 Audits, Reviews and Inspections (including subheadings)
Responsibility and Accountability Has the organisation defined, documented and communicated the areas of accountability and responsibility of all personnel involved in the OHSMS's operation? Has the accountability and responsibility of contractors been defined?	✓		HSEMP 5 Structure and Responsibilities (including sub headings) Appendices 2-13b.
Has the organisation appointed a Management Representative(s) who ensures that OHSMS requirements are established, implemented and maintained?	✓		HSEMP 5 Structure and Responsibilities (All Personnel)
Does the Management Representative(s) report on the performance of the OHSMS to top management for review and as a basis for improvement of the OHSMS?	✓		HSEMP 5 Structure and Responsibilities.
Training and Competency Has the organisation in consultation with employees identified training needs in relation to performing work activities competently, including OHS training? Are procedures in place to ensure that OHS competencies are developed and maintained?	✓		HSEMP 15 Training, Competency and Resourcing (including sub headings) HSEMP 15.2 Site Training Needs (including sub headings)
Are procedures in place for providing OHS training?	✓		HSEMP 15 Training, Competency and Resourcing (including subheadings)
Are all personnel (including contractors and visitors) provided with OHS training appropriate to the identified needs?	✓		HSEMP 15.2.2 Verification of Skills and Competency.
Do persons with the appropriate knowledge, skills and experience carry out the OHS training?	✓		HSEMP 15.4.1 Creation of Site Training Materials

AS/NZS 4801:2001 Suitability Audit Checklist

Requirements	Compliance		Improvements/Comments
	Yes	No	
Consultation, Communication and Reporting Are documented procedures available, agreed to by employees, for employee involvement and consultation in OHS issues?	✓		HSEMP 6.1 Internal Communication and Consultation (including sub headings) HSEMP 6.2 Resolution of HSE Issues (including 096 Toolbox – HSE Issue Resolution document). NOTE: The toolbox makes reference to WHS legislation and its applicable regulations. It should be noted that there is a requirement within OSH Act 1984 Division 6 Resolution of workplace issues and refusal to work on grounds of risk.
Are employees involved in the development, implementation and review of policies and procedures for hazard identification, hazard/risk assessment and control of hazards/risks?	✓		HSEMP 6.1 Internal Communication and Consultation (including sub headings)
Are employees consulted where changes affect workplace OHS?	✓		Inductions, Prestart and Toolbox Meetings.
Are employees involved with the selection of persons who represent them on OHS matters?	✓		HSEMP 6.1 Internal Communication and Consultation.
Are employees informed as to whom are their OHS representative(s)?	✓		HSEMP 6.1.4 Health and Safety Representatives
Are OHS representative(s) appropriately trained?	✓		HSEMP 6.1.4 Health & Safety Representatives.

AS/NZS 4801:2001 Suitability Audit Checklist

Requirements	Compliance		Improvements/Comments
	Yes	No	
Communication Are procedures available for ensuring that pertinent OHS information is communicated to and from employees and other interested parties?	✓		HSEMP 6 Communication and Consultation (including sub headings)
Reporting Are procedures available for the relevant and timely reporting of information to ensure that the OHSMS is monitored and performance improved? The Principal requires that the Contractor promptly notify the Principal of any potentially or actually hazardous incident or accident that occurs during the carrying out of the Works whether or not the incident or accident resulted in injury or damage; The Principal states the Contractor must within 3 days of any such incident or accident occurring or such other period specified by the Principal, provide the Principal with a report setting out complete details of the incident or accident, including the results of any investigations into its causes and any recommendations or strategies for future prevention; and The Principal states the Contractor must provide the Principal with copies of any notice provided by the contractor to any Authority under the OSH Law	✓		HSEMP 7.4.1 Hazard Reporting. HSEMP 7.4.3 Take 5 HSEMP 13.2 Notifications and Reporting (including sub headings) HSEMP 16. Continual Improvement Reporting (including subheadings) HSEMP 17 Auditing, Reviews and Inspections
Do the procedures define OHS performance reporting, incident/system failures, identified hazards, hazard/risk assessment, preventive/corrective action and statutory reporting requirements? The Principal require the contractor to immediately comply with directions on safety, including any improvement or prohibition notice, issued by any relevant Authority or by the Principal or the Superintendent and provide a copy of any direction issued by a relevant Authority to the Superintendent and Principal within 24 hours of receipt.	✓		HSEMP 13.2 Notifications and Reporting (including sub headings). HSEMP 16.1.1 Monthly Reports

AS/NZS 4801:2001 Suitability Audit Checklist

Requirement	Compliance		Improvement/Comments
	Yes	No	
Documentation Has the organisation established, implemented and maintained information (in a suitable medium) that describes the core elements of the management system and their interaction, providing direction to related documents as required?	✓		HSEMP 18 Document and Record Control. HSEMP - Reference is made to the QHEST and GENIE systems.
Document and Data Control Has the organisation established, implemented and maintained procedures for controlling all relevant documents and data?	✓		HSEMP 18 Document and Record Control. HSEMP Reference is made to the QHEST and GENIE systems.
Can documents be readily located?	✓		HSEMP 18 Document and Record Control. HSEMP Reference is made to the QHEST and GENIE systems.
Are they periodically reviewed, revised as necessary and approved by competent and responsible personnel?	✓		HSEMP 18 Document and Record Control. HSEMP Reference is made to the QHEST and GENIE systems.
Are obsolete documents and data promptly removed from all points of issue and use or otherwise assured against unintended use?	✓		HSEMP 18 Document and Record Control. HSEMP Reference is made to the QHEST and GENIE systems.
Are documents and data legible, dated (e.g. revision), readily identifiable and maintained for specified periods?	✓		HSEMP 18 Document and Record Control. HSEMP Reference is made to the QHEST and GENIE systems.
Do procedures establish responsibilities concerning the creation and modification of documents and data?	✓		HSEMP 18 Document and Record Control. HSEMP Reference is made to the QHEST and GENIE systems.

AS/NZS 4801:2001 Suitability Audit Checklist

5
"Talk it and Walk it"

Requirement	Compliance		Improvement/Comments
	Yes	No	
Hazard Identification, Hazard/Risk Assessment and Control of Hazards/Risks Has the organisation established, implemented and maintained documented procedures for hazard identification, hazard/risk assessment, control of hazards/risks and the evaluation of steps taken?	✓		HSEMP 7 Hazard Identification and Risk Control (including sub headings)
Hazard Identification Does the identification of hazards in the workplace take into account the situation or events or combination of circumstances that has the potential to give rise to injury or illness including:	✓		HSEMP 7 Hazard Identification and Risk Control. (including sub headings) HSEMP 8 Health and Safety Hazard Management (including sub headings) HSEMP 11 Plant and Equipment Control (including sub headings) HSEMP 10.2 Procurement. HSEMP 10.1 Selection of Subcontractors / Suppliers. CRAW Risk Register
The nature of potential injury or illness relevant to the activity, product or service?			
Does the identification process include the way work is organised?			
The design of workplaces, work processes, materials, plant and equipment?			
The fabrication, installation and commissioning and handling and disposal (of materials, plant and equipment)?			
The purchase of goods and services?			
The contracting and sub-contracting of plant, equipment, services and labour?			
The inspection and maintenance, testing repair and replacement (for plant and equipment)?			
Hazard/Risk Assessment Are risks assessed and have control priorities assigned based on the established level of risk?	✓		HSEMP 7 Hazard Identification and Risk Control CRAW Risk Register
Control of Hazards/Risks Are risks controlled through a preferred order of control methods (hierarchy)?	✓		HSEMP 7.1 Hierarchy of Control CRAW Risk Register
Is elimination the first control method to be considered?	✓		HSEMP 7.1 Hierarchy of Control CRAW Risk Register
Are the processes of hazard identification, hazard/risk assessment and the control of hazards/risks subjected to a documented evaluation and modified as necessary?	✓		HSEMP 7 Hazard Identification and Risk Control (including sub headings)

AS/NZS 4801:2001 Suitability Audit Checklist

Requirement	Compliance		Improvement/Comments
	Yes	No	
Hazard/Risk Assessment Are risks assessed and have control priorities assigned based on the established level of risk?	✓		HSEMP 7 Hazard Identification and Risk Control CRAW Risk Register
Control of Hazards/Risks Are risks controlled through a preferred order of control methods (hierarchy)?	✓		HSEMP 7.1 Hierarchy of Control CRAW Risk Register
Is elimination the first control method to be considered?	✓		HSEMP 7.1 Hierarchy of Control CRAW Risk Register
Are the processes of hazard identification, hazard/risk assessment and the control of hazards/risks subjected to a documented evaluation and modified as necessary?	✓		HSEMP 7 Hazard Identification and Risk Control (including sub headings)

AS/NZS 4801:2001 Suitability Audit Checklist

Requirement	Compliance		Improvement/Comments
	Yes	No	
Emergency Preparedness and Response			HSEMP 13.1 Emergency / Incident Planning and Control. Western Paddock Remediation Emergency Response Management Plan
Has the organisation identified all potential emergency situations?	✓		
Are documented procedures available for preventing and mitigating the associated illness or injury?	✓		
Are emergency preparedness and response procedures reviewed (in particular after the occurrence of an incident or emergency situation)?	✓		
Are emergency procedures periodically tested?	✓		
4.5 Monitoring and Evaluation			HSEMP 7 Hazard Identification and Risk Control (including sub headings) HSEMP 17 Auditing, Reviews and Inspections (including sub headings) HSEMP 17 Auditing, Reviews and Inspections (including sub headings)
Has the organisation established, implemented and maintained documented procedures to monitor and measure on a regular basis the key characteristics of its operations and activities that can cause illness and injury?	✓		
Is the effectiveness of these measures evaluated?	✓		
Is equipment used to monitor and measure related health and safety risks identified, calibrated, maintained and stored as necessary?	✓		HSEMP 17.1.2 General Maintenance, Inspection and Testing. Appendix 8 – Air Quality and Dust Management Sub Plan. Appendix 9 – Noise and Vibration Management Sub Plan
Are procedures available that ensure monitoring of the organisation's performance, effectiveness of relevant operational controls and conformance with the organisation's objectives and targets and compliance with relevant OHS legislation?	✓		HSEMP 3.2. Objectives and Targets HSEMP 16 Continual Improvement Reporting (include sub headings) HSEMP 17 Auditing, Reviews and Inspections (including sub headings)

AS/NZS 4801:2001 Suitability Audit Checklist

Requirement	Compliance		Improvement/Comments
	Yes	No	
Health Surveillance Has the organisation identified those situations where employee health surveillance is required? (Employees have access to their results)?	✓		HSEMP 14.3.2 Health Surveillance.
Has the organisation identified specific hazards that shall be monitored and recorded as required by legislation?	✓		HSEMP 14.3.2 Health Surveillance.
Incident Investigation, Corrective and Preventive Action Has the organisation established, implemented and maintained procedures for investigating, responding to and taking action to minimise any harm caused from incidents, system failures and initiating and completing appropriate corrective and preventive action?	✓		HSEMP 13.2 Notifications and Reporting (including sub headings) HSEMP 13.3 Investigations HSEMP 13.4 Review and Communication of Incidents HSEMP 16.2 Site Monthly HSEQ Management Meetings HSEMP 17.3 Corrective Actions.
Are changes recorded as a result of corrective and preventive action?	✓		HSEMP 17.3 Corrective Actions.
Records and Records Management Has the organisation established, implemented and maintained procedures for the identification, maintenance and disposition of OHS records as well as the results of audits and reviews?	✓		HSEMP 17 Auditing, Reviews and Inspections. HSEMP 18 Document & Record Control.
Are OHS records legible, identifiable and traceable to the activity, product or service involved?	✓		OSH records are recorded on the QHEST system. Application to be confirmed onsite
Are OHS records stored in such a way that they are readily retrievable and protected from damage, deterioration or loss?	✓		HSEMP 18 Document & Record Control. OSH records are recorded on the QHEST system. Application to be confirmed onsite

AS/NZS 4801:2001 Suitability Audit Checklist

Requirement	Compliance		Improvement/Comments
	Yes	No	
OHSMS Audit Has the organisation established, implemented and maintained an audit programme and procedures for the periodic audit of the OHSMS by a competent person?	✓		HSEMP 17 Auditing, Reviews and Inspections (including sub headings)
Proper implementation and maintenance of the OHSMS?	✓		HSEMP
Is effective in meeting the organisation's policy as well as the objectives and targets for continual improvement?			To be confirmed onsite
Are audit results provided to management and employees?	✓		HSEMP 16 Continual Improvement Monitoring (sub headings) HSEMP 6.1 Internal Communication and Consultation (including sub headings)
Is the audit programme/schedule based on the OHS importance of the activity concerned?	✓		HSEMP 17 Auditing, Reviews and Inspections. Schedule does not identify when audits will occur. Meeting contract obligations in relation to audits is to be confirmed.
4.6 Management Review Does the organisation's top management review the OHSMS at defined intervals to ensure its continuing suitability, adequacy and effectiveness?	✓		HSEMP 18.1 Site Monthly HSEQ Management Meetings.
Does management change policies, objectives, responsibilities and other elements of the OHSMS in the light of OHSMS audit results, changing circumstances and continual improvement?	✓		HSEMP 18.1 Site Monthly HSEQ Management Meetings. HSEMP 8.3.1 Change Management

END OF AUDIT

APPENDIX 4

Contractor Traffic Management Plan



Address

PO Box 97
Maddington WA 6109

36 Brookland Street
Beckenham, WA 6109

t: 1300 557 930
f: (08) 9258 9578

Traffic Management Plan

Original

Truck Access & Egress
Coppershop Road, Midland

QTM works # 19982

Client Georgiou Group





Date May 2015

Declaration

I Simon Goodwin (QTM AV 13 239 01) certify that this plan conforms to the Main Roads WA *Traffic Management for Works on Roads Code of Practice (March 2015)*, and *Australian Standard 1742.3 (2009)*, and included an on-site investigation as part of the design process.

Signature: 

Date: 21 / 05 / 2015

	Name / Company	Accreditation details	Date	Signed
Design	Simon Goodwin / Quality Traffic Management	QTM AV 13 239 01	20/05/2015	
Draft	Simon Goodwin / Quality Traffic Management	QTM AV 13 239 01	20/05/2015	
Review	Alan Stewart / Quality Traffic Management	QTM AV 13 003 01	21/05/2015	
RTM	Tony Shaw Shawmac Pty Ltd	RTM 0007	21/05/15	
Road Authority / Authorised Body approval	I, (Name _____), being the delegated officer of (Road Authority/Authorised Body _____) approve this Traffic Management Plan (TMP) for implementation subject to compliance with the details in the Traffic Management Plan (TMP) and Traffic Control Drawings (TCD). Signed: _____ Date: _____			

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Document history

Revision	Date	Description of revision
-	20.05.2015	Initial issue.

1.0 Project information

1.1 Commissioning

Georgiou Group commissioned **Quality Traffic Management Pty Ltd** to undertake this Traffic Management Plan for the proposed truck access & egress at Coppershop Road, Midland.

1.2 Traffic Management Plan

A Traffic Management Plan (TMP) is a document which aims to:

- Provide for a safe environment for all road users;
- Provide protection to workers, visitors, agents of the Principal and the general public from traffic hazards that may arise as a result of the construction activity;
- Minimise the disruption, congestion and delays to all road users;
- Ensure network performance is maintained at an acceptable level throughout the term of the work; and
- Ensure access to adjacent commercial premises is maintained at all times.

To achieve the above objectives, the Traffic Management Plan will:

- Ensure whenever possible, that a sufficient number of traffic lanes to accommodate vehicle traffic volumes are provided.
- Ensure that delays and traffic congestion are kept to a minimum and within acceptable levels
- Ensure that appropriate/sufficient warning and information signs are installed and that adequate guidance is provided to delineate the travel paths through the worksite.
- Ensure that the work area is free of hazards and that all road users are adequately protected from excavations and obstructions.
- Ensure that all needs of road users, motorists, pedestrians, cyclists, public transport passengers and people with disabilities are accommodated at and through the work site.
- Provide for work activities to be undertaken sequentially to reduce the adverse impacts of the work.
- Provide for safety procedures to enable work personnel to enter and leave the work area in a safe manner.
- Be used in conjunction with relevant Traffic Control Diagrams (TCDs) associated with the works.

Quality Traffic Management Pty Ltd will take the utmost care to prevent the risk of injury and/or property damage to employees, subcontractors, other contractors, road users and members of the public.

Work will not commence or continue at any location until all appropriate signs, devices and barricades are in place and in accordance with the requirements of the Traffic Management Plan. All necessary signs and traffic control devices will be installed at the work site to direct and regulate traffic movements around the work activity and ensure that adverse impacts associated with the works are kept to a minimum.

1.3 Design team

The QTM design team is comprised of three members. The team is:

- Alex Stockey (Team Leader – QTM AV 13 004 01)
- Alan Stewart (Team Leader – QTM AV 13 003 01)
- Simon Goodwin (Senior Consultant – QTM AV 13 239 01)

1.4 Design process

Correspondence was held between Simon Goodwin, from Quality Traffic Management Pty Ltd, and Steve Faulkner of Georgiou Group on Tuesday, 19th May 2015. Discussion was held regarding the requirement of the Traffic Management Plan, plus any available background information. A site visit was conducted by Alex Stockey on Tuesday, 19th May 2015 and a design conducted by Simon Goodwin on Wednesday, 20th May 2015.

1.5 Purpose and scope

The purpose of this Traffic Management Plan (TMP) is to provide traffic management and site personnel with the procedures necessary to ensure a safe working environment is maintained and that all road users are catered for at all times for the duration of the project.

This traffic management plan has been prepared for works associated with the truck access & egress on Coppershop Road, Midland for Georgiou Group using a trucks entering scheme. It involves erecting symbolic truck signage on approach to the site access & egress point whilst Georgiou Group are reshaping an existing stockpile of contaminated material south of Coppershop Road.

The purpose of this traffic management plan is to safely guide traffic past the work site and is prepared from Australian Standard 1742 part 1 – 2003, part 2 – 1994 and part 3 – 2009, and the Main Roads Western Australia Traffic Management for Works on Road Code of Practice (March 2015).

Quality Traffic Management Pty Ltd drawing 0515-19982-01 details the proposed traffic management scheme to be implemented, a copy of which can be found in the appendices of this report.

This TMP is based upon instructions received by QTM from Georgiou Group regarding Coppershop Road, Midland (“Site”) which are current as at 20th May 2015 (“Instructions”). The preparation of this TMP has involved the exercise of professional skill and judgment by QTM, and QTM has taken all reasonable care in

that regard, based upon the Instructions. QTM does not intend that this TMP is to be relied upon by Georgiou Group or any other party, except for the express purpose of Georgiou Group managing traffic at the Site, and in any event for only so long as the Site remains as described in the Instructions.

Further, QTM does not authorise Georgiou Group or any other party to modify this TMP. QTM expressly disclaims any duty of care to Georgiou Group or any third party in circumstances where this TMP is used other than to manage traffic at the Site, or the Site or this TMP are modified without QTM first being provided with the opportunity to consider and provide a professional opinion in relation to whether the TMP remains suitable in light of the proposed modifications.

1.6 Project location

The works are located at the corner of Coppershop Road & Lloyd Street. The affected area is indicated in figure 1.0 below.

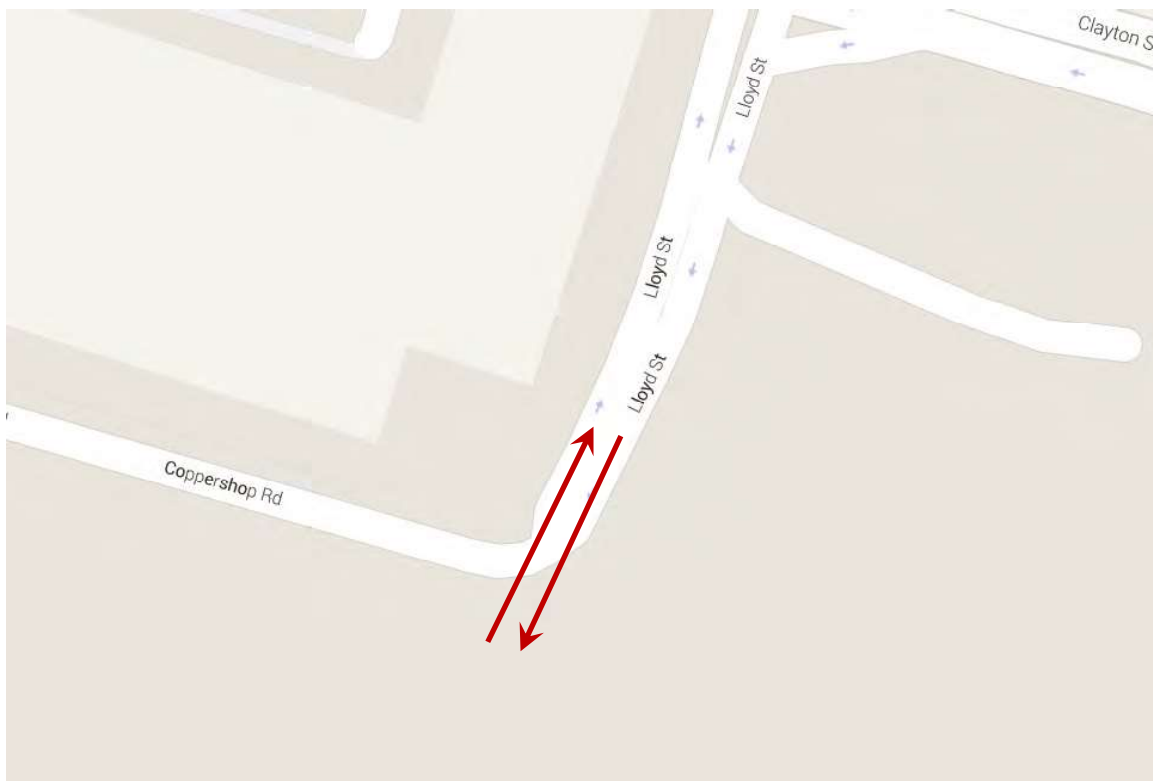


Figure 1.0 Work area

1.7 Existing environment and site constraints

Coppershop Road is under care, control and management of the City of Swan and is an access road. Coppershop Road is located in a built-up area where vegetation will not impede visibility. At this location Coppershop Road is a sealed one-lane each-way carriageway carrying up to approximately class 8 traffic to access a police complex & the delivery/storage areas of the nearby shopping complex.

Existing linemarking on Coppershop Road includes:

- Centre lines.

The current daily weekday traffic flow on Coppershop Road is not available.

Lloyd Street is under care, control and management of the City of Swan and is an access. Lloyd Street is located in a built-up area where vegetation will not impede visibility. At this location Lloyd Street is a sealed one-lane each-way carriageway carrying up to class 8 traffic to access Coppershop Road.

Existing linemarking on Lloyd Street includes:

- Centre lines.

The current daily weekday traffic flow on Lloyd Street between Coppershop Road & Clayton Street is approximately 936 vpd. Details of traffic volume counts are contained in the appendices of this report.

The following work periods have been proposed for the duration of the project:

<i>Start date:</i>	1 st June 2015
<i>Duration:</i>	22 weeks
<i>Start time:</i>	7am
<i>Finish time:</i>	6pm (M-F) / 1pm (Sat)

2.0 Works on roads

2.1 Project scope

Scope of project	Truck Access & Egress
Road authority	City of Swan
Local government	
Project owner	Metropolitan Redevelopment Authority
Main contractor	Georgiou Group
Details of works	
Georgiou Group shall be reshaping an existing stockpile of contaminated material, located south of Coppershop Road and shall have trucks accessing & egressing the site via the south verge at the corner of Coppershop Road & Lloyd Street. Symbolic Truck signs shall be erected on each approach to the access/egress point.	
Staging of work	
Stage 1: Truck access & egress	
Project date	1 st June 2015
Hours / days of work	7am – 6pm (M-F) / 7am – 1pm (Sat)
Duration of work	22 weeks

2.2 Roles and responsibilities

The Project Manager has the ultimate responsibility and authority to ensure the TMP is implemented for the prevention of property damage and injury to employees, contractors, sub-contractors, road users and all members of the public. He/she will ensure all site personnel are fully aware of their responsibilities, and traffic controllers are appropriately trained and accredited. He/she will ensure that sufficient controllers are available to ensure appropriate breaks are taken.

All personnel engaged in the field activities will follow the correct work practices as required by AS1742.3. The Superintendent's Representative may direct erection, relocation or removal of signs or devices, which, in their opinion, are not in accordance with the TMP and do not provide for sufficient safety for road users. Traffic Controllers are to liaise with their relevant supervisor who must be accredited with a current Advanced Worksite Traffic Management certification prior to undertaking site variations.

2.3 Project representatives

Project owner
Metropolitan Redevelopment Authority
Road authority / Local Government
City of Swan PO Box 196 MIDLAND WA 6936 p: 08 9267 9267 f: 08 9267 9444 e: swan@swan.wa.gov.au
Main contractor
Georgiou Group PO Box 1815 Osborne Park WA 6916 Steve Faulkner m: 0434 332 161 e: steve.faulkner@georgiou.com.au

2.4 Traffic management administration

TMP design
QTM Engineering Simon Goodwin 36 Brookland Street Beckenham WA 6109 p: (08) 9352 7600 f: (08) 9258 9578 e: design@qtm.net.au
Site contact
QTM Traffic Management Aaron Willetts PO Box 97 Maddington WA 6109 p: (08) 9352 7613 m: 0428 181 867 f: (08) 9258 9578 e: Aaron.Willetts@qtm.net.au
Public transport contact
Public Transport Authority PO Box 8125 Perth Business Centre 6849 p: (08) 9326 2000 e: transperthservicedisruptions@pta.wa.gov.au

3.0 Statutory requirements

3.1 Occupational safety and health

All persons and organisations undertaking these works or using the roadwork site have a duty of care under statute and common law to themselves, their employees, and all site users, lawfully using the site, to take all reasonable measures to prevent accident or injury.

This Traffic Management Plan forms part of the overall Project Safety Management Plan, and provides details on how all road users, considered likely to pass through or around the site, will be safely and efficiently managed for the full duration of site occupancy and works.

All traffic management works and control devices shall be in accordance with legislation outlined in clause 4.2 of this Traffic Management Plan.

3.2 Responsibilities

Project Manager

The project manager shall:

- Ensure all traffic control measures for this TMP are placed and maintained in accordance with this plan and the relevant Acts, Codes, Standards and Guidelines;
- Ensure suitable communication and consultation with the affected stakeholders is maintained at all times;
- Ensure inspections of the Traffic Controls are undertaken in accordance with the TMP, and results recorded. Any variations shall be detailed together with reasons;
- Review feedback from field inspections, worksite personnel and members of the public, and take action to amend the traffic control measures as appropriate following approval from the Superintendent's Representative; and
- Arrange and/or undertake any necessary audits and incident investigations.

Supervisor

The supervisor is responsible for overseeing the day-to-day activities, and is therefore responsible for the practical application of the TMP, and shall:

- Instruct workers on the relevant safety standards, including the correct wearing of high visibility safety vests, safety boots and other equipment as required;
- Ensure traffic control measures are implemented and maintained in accordance with the TMP;
- Undertake and submit the required inspection and evaluation reports to management;

- Render assistance to road users and stakeholders when incidents arising out of the works affect the network performance or the safety of road users and workers; and
- Take appropriate action to correct unsafe conditions, including any necessary modifications to the TMP.

Traffic management personnel

At least one person on site shall be accredited in Basic Worksite Traffic Management, and shall have the responsibility of ensuring the traffic management devices are set out in accordance with the TMP.

At least one person accredited in Advanced Worksite Traffic Management or Worksite Traffic Management shall be available to attend the site at short notice at all times to manage variations, contingencies and emergencies, and to take overall responsibility for traffic management.

Traffic Controllers

Traffic Controllers shall be used to control road users to avoid conflict with plant, workers, traffic and pedestrians, and to stop and direct traffic in emergency situations. Traffic Controllers shall:

- Operate in accordance with Section 4.10 and Appendix C of AS1742.3;
- Hold a current Traffic Controller's accreditation in Western Australia;
- Undertake a drive through inspection of the site immediately after installation, regularly while installed, and after any change is implemented as directed;
- Wear approved high visibility vests in the correct manner; and
- Be relieved from their duty after no more than two hours for a period of rest or other duties of at least fifteen minutes as required by AS 1742.3 and/or OS&H Regulations.

Workers and subcontractors

Workers and subcontractors shall:

- Correctly wear high visibility vests, in addition to other protective equipment required (e.g. footwear, eye protection, helmet, sun protection etc), at all times whilst on the worksite;
- Comply with the requirements of the TMP and ensure no activity is undertaken that will endanger the safety of other workers or the general public; and
- Enter and leave the site by approved routes and in accordance with safe work practices.

3.3 Personal Protective Equipment (PPE)

To be worn at all times by all personnel on site, associated with the works:

- High visibility clothing/safety vests (closed at front and back at all times)
- Safety boots
- Safety glasses*
- Hearing protection*
- Long sleeve/trouser clothing

- Protective headwear*

* If required by the Site Safety Plan

Note all protective equipment to be of approved type/standard in accordance with Project Safety Plan requirements.

All incidents/accidents shall be managed to minimise risk of further injury or damage. They shall be reported to the appropriate authority (eg the Police or Worksafe) if appropriate without delay and a comprehensive record of the occurrence and prior site conditions shall be documented.

3.4 Plant and equipment

All plant and equipment at the workplace shall meet statutory requirements and have the required registration, licences or certification where required. All mobile equipment shall be fitted with suitable reversing alarms. All mobile plant and vehicles shall be fitted with a pair of rotating flashing yellow lamps in accordance with AS1742.3 clause 3.12.1. All workers will be made aware of the safe work practice at the time of the site induction.

3.5 Breakdowns and traffic accidents

In the event of a vehicle breakdown, traffic accident or other incident that creates congestion and causes unacceptable delays to traffic, the works will be aborted and the traffic management will be removed completely or repositioned to direct traffic around the new obstruction.

If required, First Aid shall be administered, and medical assistance shall be called for. For life threatening injuries an ambulance shall be called on **000**. The Police shall also be called on **000** for traffic crashes where life threatening injuries are apparent. Any traffic crash resulting in non-life threatening injury shall *immediately* be reported to the WA Police Service on 131 444.

In case of an accident involving the public, or from which legal proceedings may arise, the following information shall be recorded:

- Location of accident
- Time and Date
- Weather Conditions
- Condition of travelled path (eg. Lane width and surface condition)
- Details of the accident
- Details of any injured person
- Details of vehicle(s) involved
- Details of emergency services called to the accident
- Details of type, size and location of signs and devices in use at the time of the accident
- Details of any traffic management devices damaged as a result of the accident
- Details of any witnesses to the accident.

Details of all incidents and accidents shall be reported to the site supervisor and project manager using the incident report form found in the appendices of this report.

Refer to clause 5.9 'Emergency Arrangements' for specific instructions in the case of an emergency situation.

4.0 Planning

4.1 Risk identification and assessment

Risk analysis of the proposed works has identified a number of risk events/items that will be managed by effective traffic management planning and the implementation of this TMP. The assessment process has been undertaken in accordance with AS/NZS ISO 31000:2009, Risk management - Principles and guidelines and with consideration of the Main Roads WA Specification 202 (Traffic).

All identified risks have been treated by development of this TMP. Unforeseen risks arising during the works will be treated in accordance with standard work practices and procedures where appropriate.

Qualitative measures of consequence or impact

Level	Descriptor	Example Descriptions
1	Insignificant	<ul style="list-style-type: none"> Mid block hourly traffic flow per lane is equal to or less than the allowable lane capacity detailed in AS1742.3. No impact to the performance of the network. Affected intersection leg operates at a Level of Service (LoS) of A or B No property damage
2	Minor	<ul style="list-style-type: none"> Mid block hourly traffic flow per lane is greater than the allowable road capacity and less than 110% of the allowable road capacity as detailed in AS1742.3. Minor impact to the performance of the network. Intersection performance operates at a Level of Service (LoS) of C Minor property damage
3	Moderate	<ul style="list-style-type: none"> Midblock hourly traffic flow per lane is equal to and greater than 110% and less than 135% of allowable road capacity as detailed in AS1742.3. Moderate impact to the performance of the network. Intersection performance operates at a Level of Service (LoS) of D Moderate property damage
4	Major	<ul style="list-style-type: none"> Midblock hourly traffic flow per lane is equal to and greater than 135% and less than 170% of allowable road capacity as detailed in AS1742.3. Major impact to the performance of the network. Intersection performance operates at a Level of Service (LoS) of E Major property damage
5	Catastrophic	<ul style="list-style-type: none"> Midblock hourly traffic flow per lane is equal to and greater than 170% of allowable road capacity as detailed in AS1742.3. Unacceptable impact to the performance of the network. Intersection performance operates at a Level of Service (LoS) of F Total property damage.

OSH qualitative measures of consequence or impact

Level	Descriptor	Example Descriptions
1	Insignificant	No injuries, low financial loss.
2	Minor	First aid treatment, on-site release immediately contained, medium financial loss.
3	Moderate	Medical treatment required, on-site release contained with outside assistance, high financial loss.
4	Major	Extensive injuries, loss of production capability, off-site release with no detrimental effects, major financial loss.
5	Catastrophic	Death, toxic release off site with detrimental effect, huge financial loss.

Qualitative measures of likelihood

Level	Descriptor	Description
A	Almost Certain	The event or hazard: <ul style="list-style-type: none"> is expected to occur in most circumstances, will probably occur with a frequency in excess of 10 times per year.
B	Likely	The event or hazard: <ul style="list-style-type: none"> will probably occur in most circumstances, will probably occur with a frequency of between 1 and 10 times per year.
C	Possible	The event or hazard: <ul style="list-style-type: none"> might occur at some time, will probably occur with a frequency of 0.1 to 1 times per year (i.e. once in 1 to 10 years).
D	Unlikely	The event or hazard: <ul style="list-style-type: none"> could occur at some time, will probably occur with a frequency of 0.01 to 0.1 times per year (i.e. once in 10 to 100 years).
E	Rare	The event or hazard: <ul style="list-style-type: none"> may occur only in exceptional circumstances, will probably occur with a frequency of less than 0.01 times per year (i.e. less than once in 100 years).

Qualitative risk analysis matrix – level of risk

Likelihood	Consequences				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
A	M	H	H	E	E
B	L	M	H	E	E
C	L	M	H	E	E
D	L	L	M	H	E
E	L	L	M	H	H

Management approach for residual risk

Residual Risk Rating		Required Treatment
E	Extreme Risk	Unacceptable risk. HOLD POINT. Work cannot proceed until risk has been reduced.
H	High Risk	High priority, OSH MR and Roadworks Traffic Manager (RTM) must review the risk assessment and approve the treatment and endorse the TCD prior to its implementation.
M	Moderate Risk	Medium Risk, standard traffic control and work practices subject to review by accredited AWTM personnel prior to implementation.
L	Low Risk	Managed in accordance with the approved management procedures and traffic control practices.

Risk ID	The Risk	Risk Source(s)/Cause(s)	Mitigating Factors	Likelihood	Consequence	Risk Rating	Response	Likelihood	Consequence	Residual
1	Personnel may be injured or killed by a passing vehicle while attempting to install and/or remove signs and devices	Exposure of personnel to oncoming traffic Visibility of personnel	Adequate sight distance for oncoming vehicles	D	3	M	Ensure works personnel are protected by vehicle, have appropriate accreditation and are aware of correct procedures. Ensure all traffic controllers have been sufficiently trained, assessed and are wearing appropriate PPE.	E	3	M
2	Construction traffic entering and leaving the site may conflict with vehicles, causing injury and/or property damage	Uncontrolled access and egress from worksite by construction traffic	The frequency of construction traffic accessing/exiting site is considered moderate	C	2	M	TMP Clause 4.5 details procedures for dealing with access and egress from the work area.	D	2	L
3	Vehicle breakdown and/or crash blocking the through carriageway causing unacceptable delays and congestion to the road network	Traffic management being installed during high volume periods Personnel being unable to appropriately respond to breakdowns or accidents	The location of the works is in a low volume area. The traffic management scheme is minimal and not expected to greatly impede levels of service.	D	3	M	Periods of work have been scheduled outside of peak traffic periods The TMP identifies procedures for the management of vehicle breakdown or crashes.	E	3	M
4	Traffic management signs and devices become illegible giving rise to vehicle accidents, personnel/driver injuries and/or deaths	Environment factors such as vegetation, shadows/sun, weather and the coming of night	Shoulders are clear and free from vegetation	D	1	L	A drive through inspection of the site shall occur immediately after installation, regularly while installed, and after any change is implemented.	E	1	L

4.2 Legislative and other provisions

Quality Traffic Management Pty Ltd recognises that the traffic management plan has been developed and shall be implemented with due consideration and in accordance with the following legislative, environment and industry standards:

1. OS&H Act;
2. OS&H Regulations;
3. Road Traffic Act;
4. Australian Standard 1742.3; Traffic Control Devices for Works on Roads (*);
5. MRWA Traffic Management for Works on Roads – Code of Practice March 2015;
6. Road Traffic Code 2000;
7. Utility Service Providers Code of Practice;
8. Local Government Act;
9. Australian Standard AS 1428; Mobility and Access Standard for People with Disabilities;
10. AS/NZS ISO 31000:2009, Risk management - Principles and guidelines; and
11. Australian Standard AS/NZS 4602; High visibility safety garments.

** - except where expressly overridden by Item 5*

Quality Traffic Management Pty Ltd shall ensure that the requirements of these documents and other relevant information will be monitored and the Traffic Management Plan adjusted to meet changing requirements where necessary.

4.3 Traffic assessment

Volume and composition

Traffic data is not available for Coppershop Road.

Volumes used in this report (refer to Appendix A) are based on average daily traffic data derived from historical counts.

The traffic data highlights that an acceptable level of service (LoS) in each direction can be maintained throughout the day. The carriageway is marked into 2 x 4.0m wide lanes. A minimum traffic lane width of 3.0m will be maintained throughout the term of the work.

Existing and proposed speed zones

Coppershop Road & Lloyd Street are both posted at 50kph. No speed restriction shall be necessary.

Intersection capacity

The work is located beyond 200m of a signalised intersection and therefore, is not subject to the 500vph restriction imposed by Australian Standard 1742.3.

Existing parking facilities

Parking is not permitted within the carriageway.

Heavy and oversized vehicles/loads

Vehicle classification data indicates that approximately 10% of are classified as heavy vehicles. This road is not a designated heavy haulage route or 'high-wide load' route.

Public transport

Coppershop Road and Lloyd Street are not public transport routes at this location and therefore no public transport considerations need to be made.

Special events and other works

An existing worksite for the Lloyd Street underpass will be in place during the period of operation and therefore, reasonable measures will be undertaken in the form of sufficient liaison with project managers to ensure conflict between traffic management schemes does not impede the effectiveness of traffic management.

4.4 Pedestrians, cyclists and disabled persons

These works will not impede pedestrians, cyclists and the disabled.

4.5 Access and egress from works area

- Works personnel will be advised in advance of the location of entry and exit points within the work zone.
- Traffic Controllers will be used to control traffic where construction vehicles entering or departing the work zone are likely to create a hazard for motorists.
- All points of access to and egress from the work zone shall be clearly defined and, where appropriate, shall have Trucks Entering signs displayed.

4.6 Environmental factors

- *Vegetation* – Trees shrubs and grasses etc. do not obscure the motorist's view of the planned location of traffic control devices. Where vegetation does affect the effectiveness of the traffic management, signage may be extended by 25% or reduced by 10% in order to increase visibility.
- *Shadows/Sun Glare* – Traffic control devices are located so as not to be affected by shadows. Works will be conducted outside sunrise and sunset times to avoid the likelihood of sun glare. Where shadows and/or sunglare affect the effectiveness of the traffic management, signage may be extended by 25% or reduced by 10% in order to increase visibility.
- *Weather* – Weather conditions are not expected to adversely affect the works. Should conditions deteriorate such that worker or motorist safety is jeopardised, the works will be aborted or postponed until conditions improve. Alternatively, signage may be extended by 25% to allow for greater stopping distances.

- *Night Work* – Works are programmed for daylight hours.
- *Road Geometry/Terrain* – The road is flat with ample sight distances on the approaches to the worksite. There are no grades to affect deceleration or acceleration of vehicles and current geometry meets safe stopping sight distance requirements for the existing 50kph zone.
- *Existing Signage* – There are no other traffic or advertising signs in the vicinity which could cause distractions or confusion, or which restrict sight distance.
- *Noise* – The works are being conducted during normal hours and therefore do not require noise limiting measures to be implemented.
- *Other* – There are no structures affecting sight lines or access. The surrounding environment is built-up. There are no significant dust-producing elements. Traffic will not yield excessive dust through the work area however where dust becomes an issue, the work area shall be watered to limit dust generation.

All changes to the above mentioned must result in a record being made in the site Daily Diary.

4.7 Existing road network

Traffic counts determine that there is minimal impact on the existing road network.

4.8 Works program

Work stage	TCD number(s)
Stage 1 – Truck Access & Egress	0515-19982-01

Refer to Appendix D

4.9 Night works

Works will not be subject to night conditions. Existing street lighting provides adequate illumination for traffic where visibility may be reduced as a result of poor natural light.

4.10 Emergency planning

- *Emergency Services* – Emergency services shall be notified via the below mentioned of the proposed works nature, location, date and times as well as contact details for the site supervisor.

Emergency Service	Fax	E-mail
WA Police Service	(08) 9222 1766	State.Traffic.Intelligence.Planning.&.Co-ordination.Unit.SMIL@police.wa.gov.au
St. John Ambulance	(08) 9277 6662	comms@ambulance.net.au
DFES	(08) 9323 9384	dfes@dfes.wa.gov.au

- *Dangerous Goods* – Refer DFES contact above
- *Damage to Services* – In the event that gas services are damaged, all work shall cease immediately, machinery and vehicles turned off and the area cleared of personnel as soon as possible. Traffic Controllers (and other personnel if necessary) shall be deployed immediately to

ensure no traffic or other road users approach the area. The Police Service and relevant supply authority shall be contacted immediately. Damage to any other services shall be treated in a similar manner except machinery may remain operational and access may be maintained where it is safe to do so.

- All site personnel shall be briefed on evacuation and control procedures.
- *Failure of Services –*
 - Failure of Street Lighting – Western Power (free call) 1800 622 008
 - Failure of Power – Western Power (free call) 1800 622 008

The nearest medical assistance is at : Swan Districts Hospital

Address: 1 Eveline Road MIDDLE SWAN WA 6056

Telephone: 08 9347 5244

4.11 Stakeholders and Local Government Authorities

The stakeholders listed below will be advised of the timing and duration of the closure(s).

Stakeholder	Contact
▪ Local Government Authority (Swan)	swan@swan.wa.gov.au

The above table must be used in conjunction with the *Notification of Roadworks* form from Appendix 3 of the MRWA Code of Practice March 2015 (TMP Appendix C).

4.12 Public notification

Due to the low-impact nature of the works, no public notification will take place.

5.0 Implementation

5.1 Hazard identification, risk assessment and control

In establishing adequate controls for the hazards identified in Section 4.1, Quality Traffic Management Pty Ltd have used a structured approach via the use of the hierarchy of control as outlined below:

- Elimination;
- Substitution;
- Engineering;
- Administration;
- Personal Protective Equipment.

The Site Supervisor and Traffic Management Crew Leader will evaluate all traffic arrangements before they are open to traffic and immediately following the opening to traffic. Adjustments are to be made as required with approval from an AWTM holder and recorded in the daily diary, including reasons for the changes. The Site Supervisor and Traffic Management Crew Leader are also required to evaluate the traffic arrangements where site conditions change. New hazards that arise throughout the work will be subject to risk assessment and incorporated onto the risk register.


5.2 Sign Erection, Maintenance & Removal

- Before work commences, signs and devices at the approaches to the work area should be erected in accordance with the installation plan in the following sequence before installing cones and other devices:
 - All other required warning and regulatory signs.
- A vehicle displaying vehicle mounted warning devices as specified in Clause 3.12.1(b) or (c) of AS1742.3 as appropriate shall be used in advance of the signs position to protect workers setting out or retrieving the signs, or reinstating them if displaced or knocked over.
- Signs and devices that are erected before they are required shall be covered by a suitable material. The cover shall be removed immediately prior to the commencement of work.
- Signs and devices are to be removed in the reverse order of installation.
- Work shall not commence or continue until all signs, devices and barricades are in place and operational in accordance with the requirements of the TMP.
- Signs shall be in accordance with AS 1742 (and manufactured in accordance with AS 1743), shall be at least size 'A' and shall be Class 1 retro-reflective.
- Prior to loading on vehicle for use on road, all signs shall be checked for damage and cleanliness and repaired, replaced or cleaned as necessary.
- Signs and devices shall be erected in accordance with the locations and spacings shown on the drawings such that:
 - They are properly displayed and securely mounted;

- They are within the driver's line of sight;
 - They cannot be obscured from view;
 - They do not obscure other devices from the driver's line of sight;
 - They do not become a possible hazard to workers or road users; and
 - They do not deflect traffic into an undesirable path.
- A detailed listing depicting the type and quantity of devices required to implement this TMP can be found below. Should the use of additional or reduced number of devices be required due to unforeseen needs, they shall be recorded within the Daily Diary as a variation to the TMP, following prior approval.

5.3 Signs & Devices List

Other Roadworks Signs & Devices



Sign/Device	Schematic	Sign code	Size, mm	Quantity
Trucks (Rectangular)		T2-25A	900 x 600	2
Sandbags				x
Bipods				4

Personal Protective Equipment (PPE) requirements

Unit	Schematic	Quantity
Safety helmet		X
Ear protection		X
Eye protection		X
Reflective safety vests (day)		X
Reflective safety vests (night)		X
Safety boots		X

X – value to be determined by site supervisor

Personnel requirements

Unit	Schematic	Quantity
Traffic Controllers		1
Vehicles		1

5.4 After-hours maintenance of works

Works will not be subject to after hours requirements.

5.5 Pavement marking

Existing pavement markings will not be affected by these works.

5.6 Variable Message Signs (VMS)

Variable Message Signs will not be necessary for these works.

5.7 Delineation devices

No delineation is required or can be applied to these works.

5.8 Temporary speed zones

Works will not require any temporary speed zones.

5.9 Emergency arrangements

Emergency services will have continual access to all properties and the worksite; hence no specific facilities are required. A Traffic Controller shall assist emergency vehicles requiring to enter and/or travel through the worksite. Emergency services shall be notified via DFES (using the *Notification of Roadworks* form from Appendix 3 of the MRWA Code of Practice March 2015) of the proposed works nature, location, date and times as well as contact details for the site supervisor.

Vehicle breakdown and/or crashes can cause considerable delay and congestion. Network efficiency is to be maintained by the accredited traffic controllers on-site and adherence to the procedure outlined in clause 3.5 shall be observed.

The occurrence of a fatality or serious injury within the worksite requires that the following be enacted:

- Site is to be contained so as to preserve the conditions at the time of or immediately following the incident, with the following considerations:
 - Lanes/Carriageways/Roads to be closed to ensure containment and preservation of site in accordance with the requirements specified in Appendix B of AS/NZS 1906.1. Traffic flows shall be maintained only where they present no risk to the containment of the site.
 - Contamination of site shall occur only for the purpose of preventing a loss of life or rendering assistance. The preservation of evidence takes priority over the passage of traffic.
- Emergency services to be contacted via 000 and provided with the following information:
 - The location of the site.
 - A short, concise description of the incident that has occurred.
 - Your name and contact number.

- Any information that may assist the emergency services in accessing the incident such as road closures or obstructions.

Should an incident occur on Coppershop Road or Lloyd Street, implement stop slow to guide traffic around the obstruction. If there is no through passage past the obstruction available, park work vehicles across the road at the nearest side road and inform traffic to find an alternate route until emergency services arrive with instructions.

5.10 Mobile works

Works will not be subject to mobile works.

6.0 Monitoring and measurement

6.1 Site inspections and record keeping

The Project Manager will ensure that the Traffic Management Plan is implemented and evaluated for effectiveness. The Supervisor shall inspect and monitor traffic movements around the site in conjunction with the personnel who have erected the control measures. The outcomes of the inspection will be diarised for the information of the Project Manager.

Inspections shall be undertaken on an hourly basis, as and when required, and at a minimum on the following occasions:

- Before the start of work activities on site;
- During the hours of work;
- Closing down at the end of the shift period; and
- After hours.

A daily record of the inspections shall be kept indicating:

- When traffic controls were erected;
- When changes to controls occurred and why the changes were undertaken; and
- Any significant incidents or observations associated with the traffic controls and their impacts on road users or adjacent properties.

Where significant changes to the work or traffic environment or adverse impacts are observed, the controls should be reviewed as a matter of urgency. Daily Diary entries shall be made by the person undertaking the inspections and reviewed by the Supervisor. All variations to the TMP/TCD, non-conformances, incidents and accidents shall be recorded. Copies of the completed report shall be forwarded to the Project Manager and the Traffic Management Supervisor.

6.2 TMP auditing

An approved auditor may wish to conduct audits of the traffic management using the 'Compliance Audit Checklist for Traffic Management for Works on Roads' available on the Main Roads website. The Project Manager shall be notified of any incongruity for rectification and future reference.

6.3 Public feedback

Complaints from the public are to be through QTM's Quality Assured Improvement Action process. The form is to be returned to company management and registered for investigation and follow-up.

7.0 Management review

7.2 TMP review and improvement

Improvement Action Summary Reports raised during the works are discussed and analysed during Management Review with specific attention to the analysis of trends. Trends are indicated by analysis of the recurrence of non-conformance categories shown in the non-conformance reports.

7.3 Variations

Any variation from AS 1742.3 or MRWA Code of Practice March 2015 shall be documented below. State the nature of the variation and the reasons the change was necessary.

Table 7.1

Variations from AS 1742.3 & MRWA Code of Practice March 2015

Variation	Reason
No Variations	

Any on-site variations shall be noted in the Daily Diary.

Appendix A Traffic flow data

Weekly Volume by Hour

Traffic Flow: Both Directions
 Site No: 51391
 Date Range: 28 Jun 2012 to 04 Jul 2012

Road Name: Lloyd St (1091173)
 Location Description: S of Clayton St (SLK 0.10)
 Count Type: Classification Counts

Average Vehicle Volume										
Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun	
0000	2	2	6	10	1	8	10	4	6	
0100	14	0	4	0	4	4	9	4	5	
0200	1	2	0	1	0	2	19	1	4	
0300	1	3	3	6	8	7	6	4	5	
0400	1	1	5	10	22	9	3	8	7	
0500	27	27	26	36	30	35	19	30	20	
0600	91	93	104	92	85	20	24	93	73	
0700	86	69	54	66	67	16	11	68	53	
0800	77	71	76	67	75	27	2	73	56	
0900	46	42	42	27	48	20	7	41	33	
1000	51	54	56	54	66	36	25	56	49	
1100	31	39	53	48	66	68	31	47	48	
1200	45	73	51	67	80	93	23	63	62	
1300	64	65	55	57	65	57	41	61	58	
1400	78	64	70	63	68	47	55	69	64	
1500	72	83	68	105	104	58	25	86	74	
1600	88	89	89	98	79	56	18	89	74	
1700	56	42	60	83	54	38	26	59	51	
1800	30	22	31	40	33	17	21	31	26	
1900	14	12	12	29	22	15	14	18	17	
2000	1	3	4	9	12	13	7	6	7	
2100	6	13	12	22	4	4	5	11	9	
2200	5	7	3	9	9	2	8	7	6	
2300	6	5	8	8	8	3	6	7	6	
Total	893	881	892	1007	1013	655	411	936	823	
Peak Statistics										
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun	
AM	1/4 Hour	0645	0645	0645	0645	0645	1115	1030	0645	0645
	1/4 Hr Vol	48	44	48	39	41	25	15	44	34
	1/2 Hour	0645	0630	0630	0630	0630	1100	1130	0630	0630
	1/2 Hr Vol	70	74	82	70	63	42	22	71	56
	1 Hour	0615	0615	0615	0615	0615	1145	1115	0615	0615
	1 Hr Vol	106	104	116	103	98	93	35	105	84
	1 Hr Fact	.5521	.5909	.6042	.6603	.5976	.6458	.7292	.5966	.61
	2 Hour	0615	0630	0630	0615	0645	1100	1130	0630	0630
PM	2 Hr Vol	189	177	177	162	165	161	68	173	135
	1/4 Hour	1600	1500	1600	1500	1500	1215	1415	1500	1500
	1/4 Hr Vol	34	48	33	39	38	36	17	37	30
	1/2 Hour	1445	1445	1600	1600	1500	1200	1415	1445	1445
	1/2 Hr Vol	53	65	57	63	56	59	34	53	44
	1 Hour	1415	1415	1600	1530	1500	1200	1345	1430	1415
	1 Hr Vol	90	97	89	112	104	93	58	90	79
	1 Hr Fact	.7031	.5052	.6742	.8235	.6642	.6458	.8529	.6114	.6679
Peak	2 Hour	1430	1415	1430	1430	1500	1200	1300	1430	1430
	2 Hr Vol	165	172	164	205	183	150	96	177	151
	12 Hour	0600	0545	0545	0545	0600	0515	0900	0545	0545
	12 Hr Vol	785	788	781	833	857	541	293	808	694

Weekly Class Report

Count: Both Directions

Road Name: Lloyd St (1091173)

Site No: 51391

Location Description: S of Clayton St (SLK 0.10)

Date Range: 28 Jun 2012 to 04 Jul 2012

Vehicle Classification Scheme (AustRoads94)														
Class	1	2	3	4	5	6	7	8	9	10	11	12	% Heavy	Vehicles
Monday	788	1	41	52	11	0	0	0	0	0	0	0		893
%	88.2	0.1	4.6	5.8	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6	
Tuesday	771	6	54	40	7	0	1	2	0	0	0	0		881
%	87.5	0.7	6.1	4.5	0.8	0.0	0.1	0.2	0.0	0.0	0.0	0.0	11.8	
Wednesday	768	10	43	61	7	1	1	1	0	0	0	0		892
%	86.1	1.1	4.8	6.8	0.8	0.1	0.1	0.1	0.0	0.0	0.0	0.0	12.8	
Thursday	916	12	35	31	10	1	1	1	0	0	0	0		1007
%	91.0	1.2	3.5	3.1	1.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	7.8	
Friday	896	11	40	57	8	0	0	1	0	0	0	0		1013
%	88.5	1.1	3.9	5.6	0.8	0.0	0.0	0.1	0.0	0.0	0.0	0.0	10.5	
Saturday	605	16	14	14	4	0	0	2	0	0	0	0		656
%	92.4	2.4	2.1	2.1	0.6	0.0	0.0	0.3	0.0	0.0	0.0	0.0	5.2	
Sunday	382	8	5	13	0	0	1	2	0	0	0	0		411
%	92.9	1.9	1.2	3.2	0.0	0.0	0.2	0.5	0.0	0.0	0.0	0.0	5.1	
Avg Daily Vol	1	2	3	4	5	6	7	8	9	10	11	12	% Heavy	Vehicles
ADT (M-S)	732	9	33	38	7	0	1	1	0	0	0	0		822
%	89.1	1.1	4.0	4.6	0.9	0.0	0.1	0.1	0.0	0.0	0.0	0.0	9.7	
AWT (M-F)	828	8	43	48	9	0	1	1	0	0	0	0		937
%	88.4	0.9	4.6	5.1	1.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	10.9	
Weekend	494	12	10	14	2	0	1	2	0	0	0	0		533
%	92.7	2.3	1.9	2.6	0.4	0.0	0.2	0.4	0.0	0.0	0.0	0.0	5.4	

% Heavy = Classes 3 - 12

Appendix B Public notification

Not Required

Appendix C Notification of roadworks

NOTIFICATION OF ROADWORKS

Notifications are to be distributed at least one (1) week in advance of works

Where Police attendance is required at least three (3) week's notice shall be given (except in an emergency)

Where the traffic management is to interfere with traffic signal operation, prior approval is required 3wks in advance by MRWA TOC.

Anticipated start date:	1 st June 2015	Duration:	22 weeks	
Daily work hours:	7am – 6pm (M-F) 7am – 1pm (Sat)	Is weekend work applicable?:	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Location of works (Road/Street, Suburb):	Coppershop Road, Midland			
Description of works:	Truck access & egress for reshaping an existing stockpile of contaminated material south of Coppershop Road.			
Description of traffic management arrangements:	Symbolic truck signage erected on approach.			
Posted Speed Limit:	50kph	Worksite speed limit:	Existing	After hours speed limit: existing

What is the anticipated effect on traffic flows?:	none			Will there be restricted width for oversize escorted vehicles?:	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Are lanes closed at signals?:	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>	Are signal loops or hardware affected?:	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Will signal phases need time changes?:	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>	Will signals need to revert automatically?:	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Date of signal "black out":				Times of signal "black out":		
Will Police attendance be required?:	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>		Dates for Police attendance :		
Are bridges located in area of works, (inc detours)?:	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>		Will changes to traffic flows/composition occur on bridges?:	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Are school crossings located in area of works?:	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>		Will crossings be altered during works?:	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

Road Authority:	City of Swan					
Postal Address:	PO Box 196 MIDLAND WA 6936					
Telephone:	08 9267 9267	Email:	swan@swan.wa.gov.au			Facsimile: 08 9267 9444

Construction Contractor:	Georgiou Group					
Postal Address:	PO Box 1815 Osborne Park WA 6916					
Contact:	Steve Faulkner					
Telephone:		Email:	Steve.faulkner@georgiou.com.au			Mobile: 0434 332 161
After hours contact:	Steve Faulkner					

Traffic Management Cont.:	TBD					
Postal Address:						
Telephone:		Email:		Facsimile:		
Contact:						
Telephone:		Email:		Mobile:		

Distribution List	Email/Website
WA Police State Traffic Coordination	State.Traffic.Intelligence.Planning.&.Co-ordination.Unit.SMIL@police.wa.gov.au
St John's Ambulance	ambulanceoperations@stjohnambulance.com.au
Department of Fire & Emergency Services	dfes@dfes.wa.gov.au
Local Government	swan@swan.wa.gov.au

Appendix D Traffic Control Diagram(s)

APPENDIX 5

Contractor Emergency Plan

EMERGENCY RESPONSE

MANAGEMENT PLAN

	Project Details
Client:	Metropolitan redevelopment Authority
Project Name:	Western Paddock Remediation
Project Number:	1552
Project Commencement Date:	18/05/15
Issue Date:	May 2015
ID Code:	1552-HSE-MP-002-01

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Emergency Response Management Plan

Western Paddock Remediation



Version	Date	Revision Details	Compiled by	Corporate HSE Representative	Project Manager	PM Line Manager
1	18/05/15	Initial Compilation	B White	Name: Paul Dickenson Signature:	Name: Steve Faulkner Signature:	Name: Dene Hyde Signature:
				Name: Signature:	Name: Signature:	Name: Signature:
				Name: Signature:	Name: Signature:	Name: Signature:
				Name: Signature:	Name: Signature:	Name: Signature:
				Name: Signature:	Name: Signature:	Name: Signature:

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Emergency Response Management Plan

Western Paddock Remediation



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1. INTRODUCTION AND PURPOSE

The purpose of this Management Plan is to describe how to the site will systematically manage incidents and emergencies to:

- Minimise harm/loss on workers and the environment
- Return the site to normal operations as soon as practicable
- Comply with Georgiou, Metropolitan Redevelopment Authority and legal and other obligations
- Achieve the Company, client and site objectives and targets

This Management Plan is written in accordance with Georgiou's health, safety and environment management system. The development of this Management Plan has been based upon the risks and opportunities identified and specifically address client, contractual, legal and other obligations.

This Management Plan applies to all workers and visitors to the site under Georgiou's scope of work.

1.1 Amendments and Authorisation

This Management Plan will be approved by the Project Manager, their Line Manager and the HSE Manager Operations or equivalent. The Project Manager has authorised this plan and thereby has accepted the responsibility to govern the implementation of this plan.

The minimum competencies required to be held by one or combination of the persons assessing that the ERMP adequately addresses the risks appropriately will be:

- Senior First Aid certificate and Fire Warden (nationally recognised); or formal OHS qualification
- Appropriate experience in the operation for which the ERMP covers

This Management Plan and other related documents will be reviewed annually or if deemed required by the Project Manager as a result of:

- Changes to Company procedures or processes;
- Changes to key personnel or resources;
- Changes in legal and other obligations
- Findings from an audit or inspection;
- Findings from a significant incident or near miss;
- Findings from an emergency or emergency exercise
- Significant changes to site conditions and/or work methods
- Instructions from the Metropolitan Redevelopment Authority, Emergency Control Organisation or OSH Committee if established.

Reviews will be undertaken in consultation with key stakeholders to ensure all locations/functions are considered. A record of the date and comments relating to any revisions of this document will be included in the revision table.

Only the Project Manager's authorisation is required when modifications are made in the following circumstances:

- The change is to update references/diagrams
- The change is to update content to reflect changes made to the Georgiou Management System

1.2 Distribution and Communication of this Plan

The Project Manager is accountable for ensuring:

- A copy of the Management Plans is available on site at all times
- Management Plans are registered and their distribution controlled on the Site Document Register
- Any person engaged to carry out work at a site is provided with the relevant parts/ information
- Any changes made to the Management Plan are communicated to all affected persons on the site

1.3 Supporting Management Plans

The following management plans have been developed to support this management plan:

- Georgiou Crisis Management Plan (controlled by Georgiou's Perth Head Office and available on the Company Intranet)

In addition Emergency Plans may be developed that are specific to a high risk task that is being undertaken, e.g. confined space rescue plan, fall from height plan. **Task Emergency Plans** will be referenced on JHA's or permits pertaining to the task.

1.4 Terminology & Definitions

Terms and definitions used within this document are further explained in Georgiou's **Terminology & Definitions Guideline**.

2. SCOPE OF WORKS

This Management Plan has been prepared for the Metropolitan Redevelopment Authority. The scope of works includes the following activities:

- Vegetation stripping
- Topsoil stripping
- Replacement of contaminated material on site
- Replace topsoil
- Replace Vegetation
- Install access to stockpile for maintenance

Estimated project mobilisation date of 18th May 2015 and estimated completion date of 6th July 2015.

2.1 Hours of Operation

This site will operate between the hours of 07:00 and 17:00. Any person accessing the site outside of these hours will have the written authority from the Project Manager unless part of an arranged work front and have completed a site induction.

3. COMMITMENT AND ACCOUNTABILITY

3.1 Senior Management Commitment

Senior Management Commitment will be demonstrated in accordance with the site **Health and Safety Management Plan**.

3.2 Offsite Support

Business Unit Manager

- Providing adequate support and resources to the Site to plan for and respond to emergencies
- Contact the Crisis Management Executive Director in the event of an emergency escalating to a crisis.
- Monitor an emergency to determine whether to escalate to a crisis
- Establish with site what police, ambulance and/or emergency services have been contacted
- Establish what government agencies are involved or have been contacted and details of investigating officer
- Establish statutory reporting requirements; nominate person responsible for notification

- Nominate team to investigate incident, determine requirement for Taproot investigation
- Determine who will speak to client
- Determine if site visit required by senior management

3.3 Accountabilities/Responsibilities

Project Manager

- Ongoing review of Site's risks to ensure this Plan is relevant and adequately covers identified credible emergency scenarios
- Ensure the allocation of Emergency Response personnel roles and arranging in for the replacement of Emergency Response personnel who are no longer available and nominate suitable persons to cover short-term absences
- Ensure Emergency Response personnel receive the appropriate training within a maximum six monthly interval
- Assigning a person as responsible for the maintenance of First Aid Supplies
- Supporting the ERTL in responding to an emergency
- Establishing names and emergency contacts of those injured and contacting emergency contacts
- Establishing the Hospital injured person taken to and organising persons to visit hospital injured person
- Remind site personnel, including subcontractors that all media enquiries no comments are to be given to media or published via social media
- Internal notifications in accordance to notification process
- Organising Employee Assistance Program support and other counselling assistance if required

Emergency Response Team Leader

- Establish and maintain this emergency response management plan and other related documentation
- Ensure an up-to-date Emergency Contact List is kept readily available
- Ensure emergency exercises are carried out, their effectiveness reviewed and any recommended changes to plans and procedures are made and documented
- Activating this Emergency Response Management Plan in an emergency
- Assigning a person who will collect the pre-start attendance form
- Internal notifications in accordance to notification process
- Ensure site workers receive training on emergency response procedures

Deputy Emergency Response Team Leader

- Assume the responsibility of the ERTL when absent from site
- Participate in the execution of emergency exercises and at times perform ERTL function during drills

3.4 Communication and Acceptance of Accountabilities and Responsibilities

The site emergency response personnel will acknowledge their understanding and acceptance of the site accountabilities and responsibilities by signing **Appendix 1** in the Plan.

4. LEGAL AND OTHER OBLIGATIONS

Refer to *Health and Safety Management Plan*.

5. COMMUNICATION AND CONSULTATION

The site will use the methods detailed in the site *Health and Safety Management Plan* to communicate and consult with workers and visitors in regard to the Georgiou Management System, this Management Plan, performance and sites hazards and risks.

6. HAZARD IDENTIFICATION AND RISK CONTROL

6.1 Emergency Scenarios

The following potential emergency scenarios have been identified from the site **HSE Risk Register**:

- 1) Serious Injury or Medical Emergency
- 2) Confined Space Emergency
- 3) Burst Water/Sewage Pipes/Gas Leaks
- 4) Hydrocarbon Spills
- 5) Vehicle Accident
- 6) Mobile Plant Incident
- 7) Fire/Explosion
- 8) Structural Failure
- 9) Damaged Electrical Services/ Contact with Overhead Wires
- 10) Bomb Threat
- 11) Severe Weather Event: Lightning
- 12) Severe Weather Event: Flooding
- 13) Excavation collapse
- 14) Fall From Height

6.2 First Aiders, Emergency & First Aid Equipment

The emergency and first aid equipment requirements have been determined for this site using the **First Aid and Emergency Equipment Assessment Guideline** and the Sites Risk Register. Any equipment in addition to standard first aid kits specific to those emergency scenarios will be recorded in the site's **Stock Control List** in the Sites **Master Safety Register**. A summary of the **First Aid and Emergency Equipment Assessment Form** is included below.

ITEM	DETAILS
Number of First Aiders	Minimum of 3 Snr First Aiders or 2 Snr and 2 Basic First Aiders
First Aid Room Required	No
Location Where 1st Aid Room Location will be:	N/A
Remote Workplace	No
High Risk Workplace	Yes
Number and Location of First Aid Kits	<ul style="list-style-type: none"> ▪ Three Large first Aid kits located at relevant work fronts ▪ Supervisor's vehicles - Outdoor First Aid Kit
Person/s responsible for Maintenance of kits	HSE Advisor
Emergency Response Equipment	<ul style="list-style-type: none"> ▪ Confined Space emergency rescue equipment (tripod, ropes, harness, pulley attachments and gas monitor).

First Aid Supplies, Facilities and Emergency equipment will:

- Be installed and maintained in accordance with manufacturer's instructions and/or relevant Australian Standards or equivalent
- Be stored in a manner that prevents damage
- Be located at points convenient to the workforce and within a reasonable distance from the source of the hazard, at least one first aid kit will be portable
- Have appropriate signage and lighting
- Calibrated in accordance with the specified standard (or agreed equivalent national or international standard) or calibrated to a documented procedure; or manufacturer's recommendations

- Have an emergency power supply (for critical electrical equipment e.g. warning sirens, communications, fire pumps, extraction fans, etc. and for instrumentation and control systems necessary for safe shut-down of plant)
- Be inspected in accordance with section 11.

6.3 Determination of Facilities and Emergency Response Personnel

6.3.1 Site Layout Plan

A **Site Layout Plan** will be developed and posted in prominent locations throughout the site. The **Site Layout Plan** will include locations of:

- Site Office
- Worker amenities and toilets
- Muster Points
- First aid location(s)
- Fire protection equipment
- Chemical storage
- Spill Kits
- Parking areas
- Lay down areas
- Non-smoking areas and or designated smoking areas
- Emergency/evacuation areas and muster points
- Worksite boundaries
- Protected areas, areas not to be accessed by workers
- Refuelling locations
- Loading and Unloading areas

The **Site Layout Plan** will be periodically reviewed to ensure it is up to date. The **Site Layout Plan** will be communicated at Site Induction.

6.3.2 First Aid and Medical Facilities

The **Site Emergency Evacuation Plan Template** will be used to display First Aiders on noticeboards and in addition **on the First Aid Contacts**

First Aid kits will be clearly identified or have a white cross on a green background prominently displayed on the outside and will have the names of first aiders displayed on or near the box. Vehicles equipped with a first aid kit will display a first aid sticker on the vehicle.

The closest Medical treatment facility has been identified as;

St Andrews Medical Group

9 Brockman Rd
Midland WA 6056
(08) 6274 9100

The closest Hospital has been identified as;

Swan District Hospital Campus

Eveline Road
Middle Swan WA 6056
(08) 9347 5244

A map with directions these facilities will be displayed prominently around the work site and documented in the site **Care Plan**.

6.3.3 Site Emergency Contact List

An **Emergency Contact List** will be developed and posted in prominent locations throughout the site. The **Emergency Contact List** will include:

- Local emergency services (police, ambulance etc.)
- Client Contacts
- Utility Services (Electrical, gas etc.)
- Nearest hospital and medical services
- Regulatory Bodies
- Site emergency response contacts
- Corporate office emergency response contacts
- Radio Communications information
- Site name and physical address

The **Emergency Contact list** will be periodically reviewed to ensure it is up to date. The location of the **Emergency Contact List** will be communicated at Site induction.

Each work group will have access to a mobile phone or radio within close proximity to communicate an emergency.

6.4 Site Evacuation Plan

A **Site Evacuation Plan** will be developed and posted in prominent locations throughout the site. The site evacuation plan will provide the necessary information to enable personnel to evacuate to the nearest secure designated assembly area/ muster point, by the safest and most direct route, in the event of an emergency. The site will have a primary and an alternate muster point.

The **Site Evacuation Plan** will be periodically reviewed to ensure it is up to date. The location of the **Site Evacuation Plan** will be communicated at Site induction.

6.5 Communication Methods

The communication method to alert workers of an emergency will be Air horns. The communication method to be used between the emergency response team will be through the use of two-ways. If more than one emergency response person is nominated for an area they will first assemble at the nominated communication point to confirm emergency response strategy.

When required a point will be established where an allocated person is placed to act as a visual point for the emergency services to ensure that they are directed to the emergency in the most appropriate manner.

6.6 Change Management

The site will use the methods detailed in the **Health and Safety Management Plan** to manage changes that may affect emergency preparedness and response of the site.

7. ADVERSE WEATHER EVENT

7.1 Lightning

Lightning poses a greater threat to individuals than almost any other natural hazard in Australia. Lightning can strike people causing injury or death; it can also ignite fires or cause explosions. If you can clearly hear thunder or see lightning flashes, then it is time to start taking added precautions. The audible range of lightning is generally 8 - 13 km, depending on the level of background noise. Therefore, as a general rule, when thunder is heard, precautionary action should be taken.

The ERTL will monitor lightning activity in the build-up of electrical storm events utilising the following methods:

- Flash-Bang Method - is a method of calculation to deter the distance of a lightning strike. Sound travels approximately one kilometre for every three seconds. The time (measured in seconds) between seeing a lightning flash and hearing the accompanying thunder divided by 3, gives an estimate of the distance (in kilometres) of the lightning strike. For example - when the Flash-Bang time is 30 seconds or less, lightning activity is within a distance of 10km.
- Weather Tracking - The Bureau of Meteorology (BOM) web reports can be used to monitor and deter appropriate action for an approaching storm.

7.1.1 Lightning Emergency Response

The ERTL/ or Project Manager will deter the course of action dependant on:

- Apparent intensity, speed and direction of travel of the storm, as deterred by the Flash-Bang Method, direct observation, weather reports, observations or warnings;
- If personnel are working out in the open;
- The likelihood of other severe weather associated with thunderstorms: e.g. heavy rain, limited visibility, high winds and slippery surfaces.

For lightning activity estimated within 15 km the ERTL are to consider:

- Relocating operating plant that are operating at elevated levels (e.g. high dumps/ cranes) to less exposed locations
- Instructing tower crane operator to leave the operating cab
- Moving persons on the ground to indoors or inside heavy mobile plant and light vehicle cabins

For lightning activity detected within 10 km the ERTL is to coordinate the following:

- Cease operating in the open and alert all personnel to seek shelter
- Remain sheltered for 30 minutes after the last thunder

In the event of a lightning storm the following precautions are to be followed by all personnel wherever practicable:

- Seek shelter in a substantial building or within a totally enclosed metal-bodied rubber wheeled vehicle
- If on open ground, remote from shelter, crouch down with feet together
- Avoid driving any open vehicle or any enclosed vehicle with a non-metallic roof
- Avoid high ground
- Avoid isolated trees and trees in general. If the vicinity of a tree cannot be avoided, seek position just beyond the spread of the foliage
- Avoid touching and standing close to tall metal structures or wire fences
- Avoid handling substantial metallic objects and remove metal objects from the hair or head
- If rubber tyred heavy vehicles are struck by lightning, park in 200m barricaded area for 24hours and monitor from a distance for signs of tyre fire.

7.1.2 Re-commencement of Work

The ERTL in liaison with the Project Manager will determine when it is safe to return to work.

Prior to resuming work, personnel shall check whether any damage has been caused by lightning or rain and that no physical hazards exist.

As a general guide, work can re-commence once the storm is 10 km away and moving away from the worksite.

8. RESPONSE AND ESCALATION

8.1 Emergency Response

A person who becomes aware of an incident will initiate action(s) to minimise the potential adverse impact of the event. The initial response of personnel to the incident will be to assess the situation and immediate danger taking into account Georgiou's priorities in the following order:

- 1) Safety of personnel
- 2) Protection of the environment
- 3) Protection of Georgiou property
- 4) Reputation
- 5) Liability

8.1.1 Standard Emergency Response

The following response will be the standard approach applied to an incident or emergency. It is important to recognise however, that this is not intended to be inclusive, definitive, or regulatory (except where such is a requirement of relevant legislation), and a response should be reflective of:

- Worker/s practical experience and knowledge
- Site specific situations
- Resources available

Appendix 2- Scenario Specific Checklists have been developed as a guide to assist with the additional steps that may be required to respond to site specific situations.

8.1.1.1 ICER

- 1) Isolate: Isolate the source of the problem. For example shut doors, switch off gas or electricity or secure yourself away from an intruder, rescue injured persons if safe to do so.
- 2) Contain/ Cordon: Contain or cordon off the area. For example shut down air-conditioning systems, prevent others from entering the hazardous zone or alert people in the area.
- 3) Evacuate: Evacuate via the nearest safe exit if your safety is at risk to the muster point. Stay calm, do not run.
- 4) Raise the Alarm: Raise the alarm for the premises or site, contact the emergency response team if necessary or emergency services. The procedure for raising an alarm over the two way radio as follows:

Emergency, Emergency, Emergency

- I. Your name
- II. Your location
- III. Emergency details
- IV. Assistance required
- V. Don't hang up, wait for questions or instructions

The Supervisor, and/or person responsible for the area/activity and Emergency Response Personnel will be immediately contacted in the event of an emergency and assembled to coordinate an operational response in accordance to the ERMP in order to return the site to normal operation as soon as practicable.

8.1.1.2 Evacuation

In the event of an emergency work will be discontinued as soon as it is safe to do so and persons will be alerted to evacuate to the primary muster point if safe, or alternate muster point if not safe. The method of communicating the requirement to evacuate will be by three consecutive blasts of the air horn and/or over the two way radio. The use of 2 ways is prohibited during the emergency unless the person has been addressed by the ERTL or forms part of the emergency response personnel.

The ERTL or delegate will be responsible for collecting the pre-start sign on register and accounting for all workers. If any person is reported missing, then this information will be provided to the ERTL so that any responding emergency services can conduct a search. No worker will be authorised to re-enter the incident location to search for a missing person unless it is safe to do so.

8.1.1.3 Administer First Aid

An injured person will only be approached if safe to do so, and first aid administered following DRSABC if possible; if unable to, a trained first aider will be alerted as listed the **Site Emergency Contact List**. The injured person/s must NOT be moved unless they are directly threatened with further danger.

8.1.1.4 Securing of Incident Scene

If the incident is of a serious nature the ERTL or delegate will secure the scene immediately after the situation is under control to ensure vital evidence has not been destroyed, altered or removed. Where a person has suffered serious harm, or is killed, all areas adjacent to the accident scene are to remain undisturbed until otherwise advised by an inspector or police.

8.1.1.5 Records and Collecting Evidence

If possible during the incident, a person should record the sequence of events on **Appendix 4- Incident Log**. Keeping these records whilst the incident is still going on will:

- Assist in debriefing relevant authorities attending the incident
- Assist in investigations and corrective actions following the incident
- Be much more valuable from a legal point of view than those written up later

Within 20 mins (maximum), the ERTL or delegate will gather and confirm latest details of the incident (**Appendix 3- Situation Report** may be used to record the details).

The ERTL will coordinate collecting evidence including taking photographs or video recording of the incident to assist in subsequent investigations. Emergency Response Personnel and Site Management will take all practical precautions to prevent third parties from taking photographs or video footage.

8.1.2 Emergency Brought Under Control

If the incident is able to be brought under control then it will be reported as per the **Incident Notification and Reporting Table Reference** in accordance with **HSE Reporting and Investigation Procedure**.

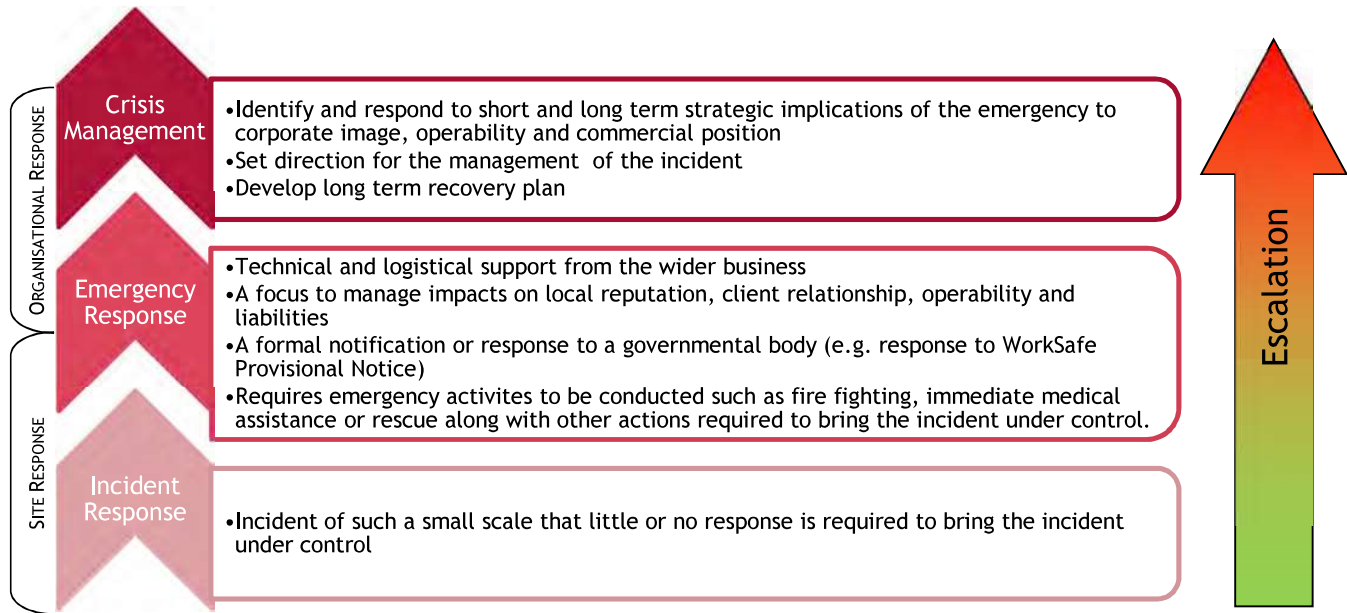
Following an incident, the applicable **Scenario Specific Checklist** in the Appendices should be completed to ensure the key steps have been followed.

8.2 Response Escalation

8.2.1 Incident not brought under control

The site ERTL or Project Manager will contact their Business Unit Manager and briefly and clearly describe the situation on site - the site name, location of the incident, potential/ actual crisis and a brief summary of the situation.

The diagram below illustrates the response progression and organisational involvement. If escalation is required this will be done in accordance with per the ***Incident Notification and Reporting Table Reference***.



8.2.2 Organisational Response

8.2.2.1 Business Unit Management Support

An incident will be deemed to require business unit management support in the event that the site requires the following to bring the incident under control or to recover from the incident:

- Tactical, technical and logistical support
- A strategic/ tactical response to manage impacts on reputation, operability or to limit liabilities
- A formal response or notification to a governmental body (e.g. response to Regulatory Improvement Notice)

Business Unit Management will become involved with an emergency to:

- Assist sites in the activation of the site's Emergency Response Management Plan
- Monitor emergency for escalation to a crisis
- Minimise the impact on the site
- Provide a consistent, coordinated and unified message internally and externally
- Build and hold client and worker confidence
- Maintain business continuity and normal operations where possible, or as soon as practicable following the incident

The Business Unit Manager will be responsible for assembling the appropriate personnel to assist in the strategic handling of the emergency.

8.2.2.2 Crisis Management Team Support

An emergency will be deemed to be escalated to a crisis where it has the potential to negatively affect the organisation as result of but not limited to:

- man-made or natural disaster
- an incident that results in a fatality
- the unlawful catastrophic destruction of the environment
- disruptions to multiple operations
- the incident attracting widespread media attention

In the event of an emergency escalating to a crisis the Project Manager or Business Unit Manager will notify the Crisis Management Executive Director immediately to activate the Georgiou Crisis Management Plan (GCMP) and assemble the Crisis Management Team. This ERMP will continue to run in conjunction with the GCMP.

8.3 Recovery/ Post emergency activities

8.3.1 Media and Statements to Third Parties

Site Management will instruct personnel that they are not to release any form of comment, video, photographs pertaining to the incident on any form of social media forums (e.g. Facebook, twitter, blog sites etc.). If requested for a statement the standard response will be:

“I am not authorised to answer your questions; however the person who can assist you is the Media and Communications Director at Georgiou Head Office in Perth.”

All statements given to third parties will be reviewed and vetted by the Media and Communications Director prior to being released to ensure that statements do not disadvantage the individual or the Company.

8.3.2 Recovery Works

As soon as possible after the emergency has been dealt with, if required, appropriate barricading/ signage will be erected to prevent unauthorised work being performed. Workers will only be permitted to recommence once the ERTL, Project Manager or relevant authority has given authorisation.

Prior to commencing any recovery works, the Project Manager will:

- Assess the risks associate with the works
- Assess any requirements to involve third parties, such as contacting utility providers, seeking Client approval to commence recovery works
- Verify with Commercial Manager any insurance, contractual or legal requirements which may have financial repercussions should recovery works commence without prior approval

Recovery works may be required after an emergency including;

- Removal of contaminated soil after a spill
- Benching to repair a collapsed excavation wall
- Repair of underground services
- Re-filling of fire extinguishers
- Re-testing of Emergency Equipment
- Re-stocking of First Aid Supplies

8.3.3 Debrief and Review

A post emergency debrief and review will be held after each actual emergency situation where everyone involved has the opportunity to have “their say” and make comment about successes and failures that occurred within the

emergency response. A record of the deficiencies identified should be recorded in the QHEST System and actions assigned including the incorporating changes into Emergency Management System documentation if required.

8.3.4 Employee Assistance Program (EAP) Counselling

After the emergency, workers that may be potentially emotionally affected by the incident will be offered EAP counselling. Example of when EAP counselling may be required:

- Witnessing serious physical injury;
- The unexpected death or suicide of a relative, friend or co-worker;
- Involvement as a victim or observer of armed robbery, assaults or other serious crimes;
- The loss of valued possessions by theft, fire and other accidents

8.4 Legal Considerations & Professional Privilege

Persons performing work on behalf of Georgiou who are involved in any incident are not to accept any liability for the incident. In the event of serious incident the General Manager - Risk will be contacted to determine the requirement for legal professional privilege.

8.5 Reporting

Reporting will be conducted in accordance with the *HSE Reporting and Investigation Procedure* as described within the Site *Health and Safety Management Plan*.

8.6 Investigations

Incident Investigation will be conducted in accordance with the *HSE Reporting and Investigation Procedure* as described within the Site *Health and Safety Management Plan*. In the event that legal professional privilege is sought Georgiou's internal investigations procedures will not apply and the investigation will be under the instruction of Georgiou's lawyers.

9. TESTING OF EMERGENCY RESPONSE

Emergency exercises will be planned and conducted by the ERTL or delegate in accordance with the identified credible emergency scenario risks in the risk register and documented within this plan to:

- Test the effectiveness of the ERMP
- Reinforce prior training and validate the competency of key emergency response personnel
- Assess site capability to respond to an emergency and improve response times
- Build confidence in team to respond to an emergency
- Test and determine adequacy of emergency response equipment and facilities
- Identify opportunities for improvement

Within 6 weeks of the site starting up, an exercise to test site alarms and communications will be conducted. A minimum of one emergency exercise will then be conducted every two months with one of these being an environmental emergency response exercise at 6 month intervals.

Emergency exercises may be in the form of:

- Resource and equipment checks
- Emergency response toolbox topics
- Desktop exercises
- Practical drills
- or other exercises designed to systematically include all personnel likely to be involved

After each practical exercise the Emergency Response Personnel will review and report on the exercise using **Emergency Exercise Review Form** in accordance with **Conducting an Emergency Exercise Guideline**. Actions that cannot be attended to immediately will be recorded in QHEST to ensure close out. The final review and report of the exercise will be communicated to the work site.

An actual emergency situation will be able to be recorded as an exercise if the components of the plan are activated. The drills will be scheduled and recorded on the **Monitoring Program** within the Site **Master Safety Register**.

10. TRAINING, COMPETENCY AND RESOURCING

The ERTL will ensure that the necessary communication, training and processes are in place to raise awareness and create vigilance in the workforce. This will be achieved by undertaking the following:

- Ensuring information (e.g. site specific emergency response procedures) is included in the induction process
- Including Emergency preparedness and response as an agenda item at tool box talks
- Training in the form of emergency exercises are carried out when required as per **Error! Reference source not found..**

10.1 Induction

Emergency preparedness and response information will be provided to all workers during site induction. All workers and visitors will be inducted onto site in accordance with the **Training and Assessment Standard** as described in the Site **Health and Safety Management Plan**.

10.2 Emergency Training

The designated emergency response personnel will be trained on how to respond to the sites identified creditable scenarios. Training may also include, if applicable, the correct use of emergency equipment such as fire extinguishers, occupancy warning systems and communication tools.

Site training needs for emergency response personnel roles will be identified and recorded in the **Site Training Matrix** and/or during the development of JHA's.

As a minimum, Emergency Response Toolboxes will be delivered to the workforce over the course of the project in accordance with the **HSE Communication and Consultation Standard**. Additional training may be delivered to the workforce based on identified risks.

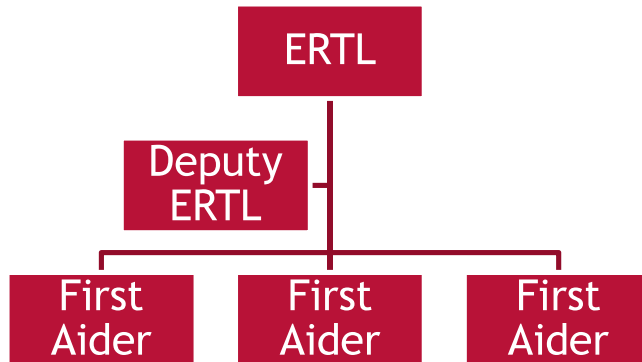
10.3 Emergency Response Team

The Emergency Control Organisation for this site is made up of the following roles:

- Emergency Response Team Leader
- Deputy Emergency Response Team Leader
- First Aiders

The Emergency Response Team (ERT) is responsible for development, implementation and maintenance of emergency response plans and procedures and coordinating external organisations such as emergency services and subcontractors. The ERT are also responsible for the management and control of the project and its operational processes and resources and related training.

The following chart shows the ERT structure.



11. AUDITING, REVIEWS AND INSPECTIONS

Audits, reviews and inspections within the workplace will be conducted in accordance with the ***Auditing, Reviews and Inspections Standard*** as described in the site ***Health and Safety Management Plan***.

At least one person will be appointed to be in charge of maintaining the first aid kits on site and should have an understanding of the products and their uses and preferably be trained in first aid. Maintenance of First Aid Kits fitted in vehicles will be the responsibility of the driver. A full inventory inspection of First Aid and Emergency Equipment will be completed as a minimum every 3 months.

The ongoing adequacy of first aid and emergency equipment at site in relation to works being undertaken will be reviewed at the Monthly HSEQ Management meetings as described in the ***Health and Safety Management Plan***.

12. DOCUMENT AND RECORD CONTROL

Emergency response and preparedness documentation that has been specifically developed for the site will be controlled on site and recorded on the ***Site Document Register*** in accordance with the Site ***Quality Management Plan***. The Project Manager is the owner of this plan and any will apply change control to ensure the most recent plans are approved and executed.

Records relating to incidents will be kept e.g. the checklists in the ERMP, drill reviews, statements and external reports and maintained in accordance with Georgiou's Document and Record Control Procedures.

13. ATTACHMENTS/APPENDICES

- Appendix 1 - Accountabilities and Responsibilities
- Appendix 2 - Scenario Specific Emergency Response Checklists
- Appendix 3 - Emergency Situation Report
- Appendix 4 - Incident Log
- Appendix 5 - Offender Description Report
- Appendix 6 - Bomb Threat Report

Emergency Response Management Plan

Western Paddock Remediation



Appendix 1 - Accountabilities and Responsibilities

Position	Name	Signature	Date
Project Manager			
ERTL			
Deputy ERTL			

Appendix 2 - Scenario Specific Checklist

Serious Injury or Medical Emergency	Responsible person	Check
1) Notify ERTL	Person identifying incident	
2) Contact emergency services 000	ERTL/Supervisor	
3) Approach the person if safe to do so, Administer first aid following DRSABC if possible; wait with injured person(s) until site assistance or Emergency Services arrive to assume control of the situation.	Person identifying incident	
4) If unable to, alert a trained first aider but DO NOT move injured persons unless they are directly threatened with further danger.	Person identifying incident	
5) Administer First Aid	First Aider	
6) Secure the scene if safe to do so	ERTL/Supervisor	
7) Emergency Services to administer medical aid and decide on the appropriate course of action to combat the emergency and ensure that all injured personnel are properly treated.	Emergency Services	
8) If injured person is transported to hospital, establish hospital location and Georgiou representative to go to hospital	ERTL/Supervisor	
9) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
10) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Confined Space Emergency	Responsible person	Check
1) If hazard identified in confined space, e.g. gas monitors alarm, confined space workers act unusually or no movement is observed, order worker to self-evacuate from the confined space as per Confined Space Emergency Plan	Stand-by Person	
2) If worker not able to self-evacuate, retrieve person using the retrieval line, Stand by person not to enter the confined space. No person will enter into a confined space to retrieve personnel unless they have confined space training and it is safe to do so.	Stand-by Person	
3) Notify ERTL	Permit Acceptor	
4) If the person(s) in the confined space is seriously injured, and the atmosphere remains safe, confined space trained first aiders may enter confined space to attend the injured; If due to falling or impact, do not remove person from the confined space unless there is immediate danger to his/her life as this may aggravate the injury	Confined Space Trained First Aider	
5) If unable to retrieve person or person unresponsive, call emergency services 000	ERTL/ Supervisor	
6) Secure the scene if safe to do so	ERTL/ Supervisor	
7) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
8) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation



Water Pipe Rupture	Responsible person	Check
1) Turn off/ remove any potential ignition sources (electrical, mobile phones, sparks)	Person identifying incident	
2) Sound the alarm / notify all persons in the vicinity	Person identifying incident	
3) Notify ERTL	Operator	
4) Isolate the area from traffic and public, workers in the immediate area should vacate and provide room for repair vehicles entering.	ERTL/Supervisor	
5) Contact Utility Provider to isolate the utility so water supply in the area can be shut off and a representative dispatched to assess the damage	ERTL/Supervisor	
6) Contact Environment Regulatory Authority if required	ERTL/Supervisor	
7) Check staff and visitors are all present at Muster Point	ERTL/Supervisor	
8) Secure the scene if safe to do so	ERTL/Supervisor	
9) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
10) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Raw Sewage Pipe Rupture	Responsible person	Check
1) Turn off/ remove any potential ignition sources (electrical, mobile phones, sparks)	Person identifying incident	
2) Sound the alarm / notify all persons in the vicinity	Person identifying incident	
3) If workers can smell Hydrogen Sulphide gas (pungent rotten smell), they should immediately evacuate to the muster points or if smell is at the muster point, designate an alternative location.	Workers	
4) Notify ERTL	Supervisor	
5) Isolate the area from traffic and public, workers in the immediate area should vacate and provide room for repair vehicles entering.	ERTL/Supervisor	
6) Contact Utility Provider to isolate the utility so supply in the area can be shut off and a representative dispatched to assess the damage	ERTL/Supervisor	
7) In the presence of a Utility Owner's representative, any contaminated soil will be excavated and transported to licensed disposal facility by licensed contractors.	ERTL/Supervisor	
8) Check staff and visitors are all present at Muster Point	ERTL/Supervisor	
9) If a worker comes in contact with raw sewage, they should be assisted to a wash down area and be thoroughly hosed down.	Supervisor	
10) All contaminated clothing should be removed, disposed of and replaced with dry clean clothes.	ERTL/Supervisor	
11) The affected person should be transported to a nearby medical centre for assessment	ERTL/Supervisor	
12) Where the sewage has contacted soil or entered a stormwater drain, the ERLT will contact Georgiou's Environmental Advisor who will assess whether the State Environment Regulatory Authority is required to be contacted	ERTL/Supervisor	
13) Secure the scene if safe to do so	ERTL/Supervisor	
14) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
15) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation



Gas Pipe Rupture	Responsible person	Check
1) Turn off/ remove any potential ignition sources (electrical, mobile phones, sparks)	Person identifying incident	
2) Turn off air-conditioning or other ventilation systems	Person identifying incident	
3) Sound the alarm / notify all persons in the vicinity	Person identifying incident	
4) All workers are to immediately evacuate and assemble at the muster point, this should be at least 150 metres from source of leak and be upwind	Supervisor	
5) Notify ERTL (not by phone)	Supervisor	
6) Isolate the area from traffic and public, workers in the immediate area should vacate and provide room for repair vehicles entering.	ERTL/Supervisor	
7) Contact Utility Provider to isolate the utility so supply in the area can be shut off and a representative dispatched to assess the damage	ERTL/Supervisor	
8) In the presence of a Utility Owner's representative, any contaminated soil will be excavated and transported to licensed disposal facility by licensed contractors.	ERTL/Supervisor	
9) Check staff and visitors are all present at Muster Point	ERTL/Supervisor	
10) If a worker comes in contact with raw sewage, they should be assisted to a wash down area and be thoroughly hosed down.	ERTL/Supervisor	
11) All contaminated clothing should be removed, disposed of and replaced with dry clean clothes.	ERTL/Supervisor	
12) The affected person should be transported to a nearby medical centre for assessment	Supervisor	
13) Where the sewage has contacted soil or entered a stormwater drain, the ERTL will contact Georgiou's Environmental Advisor who will assess whether the State Environment Regulatory Authority is required to be contacted	ERTL	
14) Secure the scene if safe to do so; until the gas supply is turned off, all traffic should be prohibited from entering until a gas supply representative has declared the site safe.	ERTL/Supervisor	
15) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
16) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation



Acid Sulphate Settlement Pond Overflow	Responsible person	Check
1) If a potential or actual loss of containment is identified, call Supervisor for assistance	Person identifying incident	
2) Notify ERTL	Supervisor	
3) Check area for stability, potential bund collapses etc. Barricade area	ERTL/Supervisor	
4) Control flow into the pond by turning off pump or by diverting flow into an alternative secure storage location such as a water cart.	ERTL/Supervisor	
5) Contain spill by using sand or common fill that can be transferred to the treatment stockpile or other contained area, prevent water from dispersing	ERTL/Supervisor	
6) Block entrance to drains using spill kits or other means and prevent spill from gaining access to any water courses by creating low points to direct flow or creating plastic lined barriers	ERTL/Supervisor	
7) Ensure all contaminated soils are taken to treatment stockpile or other contained area, allow for seepage and ensure additional soil is removed and treated to ensure pH is lowered to recommended levels	Project Engineer	
8) Secure the scene if safe to do so	ERTL/Supervisor	
9) Take photos to evidence the extent of the loss of containment	Project Engineer	
10) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
11) Ensure notification and reporting process completed as per table	Project Manager or delegate	
12) Obtain Environmental Consultant report to validate area is free of contamination	Project Engineer	

Hydrocarbon Spill	Responsible person	Check
1) Notify ERTL	Supervisor	
2) Evacuate workers if required	Supervisor	
3) Once the area is considered safe, contain spill (close valve, upright leaking drum etc.)	ERTL/Supervisor	
4) Protect storm water, use bunding, material from spill kit	ERTL/Supervisor	
5) Clean up spill using spill kit on site	ERTL/Supervisor	
6) If spill entered drain, contact Environment Regulatory Authority and Client if required	Project Manager	
7) Organising external organisation to take measurements and monitor contamination if applicable	Project Manager	
8) If the incident occurred on sandy substrate, then the contaminated soil will be excavated and transported to a licensed landfill facility by a licensed contractor.	Project Engineer	
9) If there is doubt that the contaminated soil has not been completely removed, then the local shire and DEC will be notified.	Project Engineer	
10) Secure the scene if safe to do so	ERTL/Supervisor	
11) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
12) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation



Vehicle Accident Emergency	Responsible person	Check
Note: Emergency Services will deal with any vehicle accident occurring on public roads. Accidents involving light vehicles on site will require response from site personnel.		
1) Switch off ignition if safe to do so. No attempt should be made to remove casualties from the vehicle unless other dangers are presented.	Driver or person discovering accident	
2) Notify ERTL	Driver or person discovering accident	
3) Call emergency services, 000	ERTL/ Supervisor	
4) Give first aid to casualties; remain with injured person if safe to do so. Vehicle extrication to be performed by trained emergency services personnel.	First Aider	
5) Extinguish fires if present	ERTL/ Supervisor	
6) If fuel is spilt, cover with sand, remove contaminated soil and dispose of with licensed contractor	ERTL/ Supervisor	
7) Secure the scene if safe to do so	ERTL/ Supervisor	
8) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
9) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Fixed Plant Incident	Responsible person	Check
1) Isolate the power source if safe to do so	Operator	
2) Notify ERTL	Operator	
3) If person is trapped and unable to be released by site personnel, call emergency services, 000	ERTL/ Supervisor	
4) Clear as much equipment and materials from the area as possible to make access for emergency service personnel and rescue equipment	ERTL/ Supervisor	
5) If safe to do so, stay with the injured person and keep them talking the whole time	ERTL/ Supervisor	
6) Secure the scene if safe to do so; do not allow any people to enter until emergency services give the all clear.	Project Manager	
7) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
8) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation



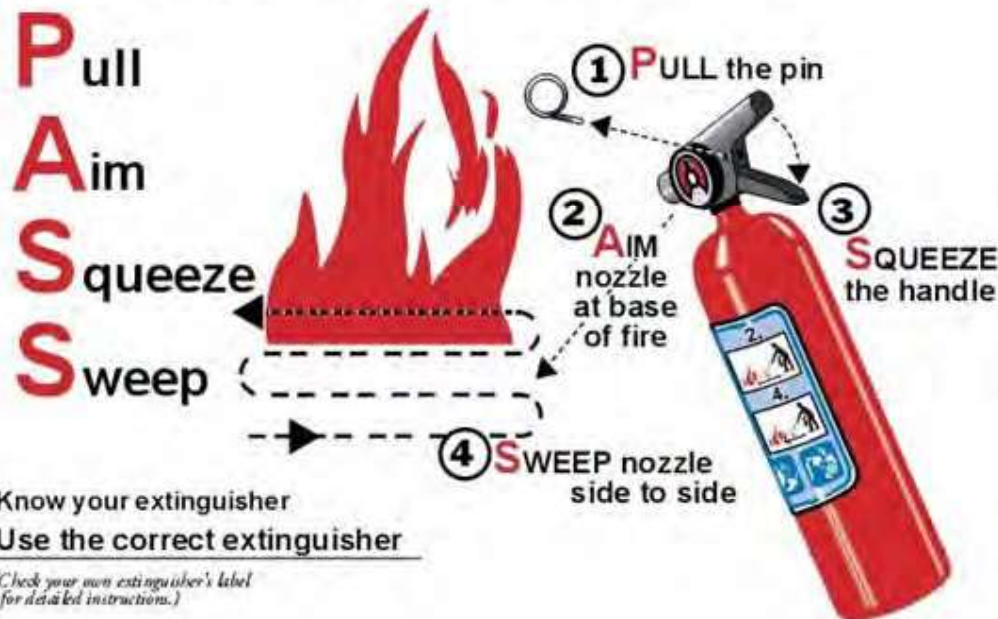
Mobile Plant Emergency	Responsible person	Check
1) Switch off ignition	Operator	
2) Notify ERTL	Supervisor	
3) Call emergency services, 000	ERTL/ Supervisor	
4) Isolate any energy sources or contain hazardous substances (e.g. power if hit power line, gas, diesel, reagents etc.) if safe to do so.	ERTL/ Supervisor	
5) Give first aid to casualties, remain with injured person(s) if safe to do so	First Aider	
6) Extinguish fires if present	ERT or persons trained in fire extinguisher use	
7) If fuel is spilt, cover with sand, remove contaminated soil and dispose of with licensed contractor	ERTL/ Supervisor	
8) Identify and contain hazardous substances if required	ERTL/ Supervisor	
9) Park up, evacuate driver to the front or rear of vehicle rather than sideways and cordon off machine. After contact with power lines or lightning strike, due to the risk of internal tyre fire, always assume that a tyre fire is present. The blast from an exploding tyre affects a 360° radius. Debris is most likely to be ejected from the side of the tyre.	ERTL/ Supervisor	
10) When evacuating on foot, descend the ladder as quickly as possible. The escape route should be in front of or to the rear of the vehicle, not to the side where there is the greatest risk of exposure to tire projectiles.	Operator	
11) Once the driver is evacuated, an exclusion zone will be set up, to give a minimum 500 m quarantine radius. Except for Emergency Services Personnel, no other persons should enter the area.	ERTL/ Supervisor	
12) In the case of a known tyre fire, no person will approach the vehicle until at least 24 hours after the last signs of visible fire or until Emergency Services have given the all clear. Whenever in doubt as to whether a tyre fire or explosion is likely, always assume the worst. Expert advice on fighting tyre fires can be obtained from the Emergency Services.	ERTL/ Supervisor	
13) Secure the scene if safe to do so	ERTL/ Supervisor	
14) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
15) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation

Fire/Explosion	Responsible person	Check
1) Remove yourself and others from danger if safe to do so	Workers	
2) Notify ERTL	Supervisor	
3) Isolate power if required	ERTL/ Supervisor	
4) Contain the fire by using correct firefighting equipment if safe and trained; never try to put out a gas fire unless the gas flow can be turned off IMMEDIATELY. If gas cannot be turned off, concentrate on stopping the spread of fire and cooling any containers.	Person trained to do so	
5) If unable to extinguish the fire after several attempts, call emergency services, 000	ERTL/ Supervisor	
6) Evacuate area if fire spreads, account for all personnel	ERTL/ Supervisor	
7) Give first aid to casualties, remain with injured person(s) if safe to do so	First Aider	
8) Contact the relevant utility providers	ERTL/ Supervisor	
9) Secure the scene if safe to do so; do not allow any people to enter until emergency services give the all clear.	ERTL/ Supervisor	
10) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
11) Ensure notification and reporting process completed as per table	Project Manager or delegate	

To operate an extinguisher:



Emergency Response Management Plan

Western Paddock Remediation



Structural Failure	Responsible person	Check
1) Shelter under structures (e.g. sturdy table, doorway etc.) whilst seismic event still underway	Workers	
2) Notify ERTL	Supervisor	
3) Evacuate area, account for all personnel	ERTL/ Supervisor	
4) Contact emergency services 000	Supervisor	
5) Contain the fire by using correct firefighting equipment if safe and trained. Do not try to extinguish any gas fires unless gas can be isolated, contact utility provider	ERTL/ Supervisor	
6) Give first aid to casualties, remain with injured person(s) if safe to do so	First Aider	
7) Contact the relevant utility providers	ERTL/ Supervisor	
8) Secure the scene if safe to do so; do not allow any people to enter until emergency services give the all clear.	ERTL/ Supervisor	
9) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
10) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation



Damage to Electrical Services/Contact with Overhead Wires	Responsible person	Check
1) If there is a power line nearby, do not approach the victim as the electricity can 'arc' through air. Maintain a minimum distance of 6m	Worker	
2) Notify ERTL	Supervisor	
3) Isolate the area from traffic and public	Supervisor	
4) Contact the relevant power utility immediately to disconnect the power	Supervisor	
5) Notify Project Manager	Supervisor	
6) When the power has been disconnected and if safe to do so, assist the victim	ERTL	
7) If there is a fire, and if safe to do so, remove victim from the danger and into a safe area	ERTL	
8) Contact a trained first aider for assistance	ERTL	
9) If it is safe to do so, electrical fires may be suppressed using Class E fire extinguishers. Before any attempt at fire suppression, make sure the electricity has been turned off. If unsure, do not approach the fire.	ERTL	
10) Contact emergency services 000 if required	ERTL/Supervisor	
11) Secure the scene if safe to do so; do not allow any people to enter until emergency services give the all clear.	ERTL/Supervisor	
12) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
13) Ensure notification and reporting process completed as per table	Project Manager or delegate	
PLANT ELECTRICALLY CHARGED WITH OCCUPANT INSIDE		
1) Operator to remain in machine until the power has been turned off	Operator	
2) If there is a requirement to urgently evacuate the machine e.g. due to fire, jump as high and as far as possible from the vehicle. Do not touch the vehicle and ground at the same time as this creates a path for electricity to pass through the body.	Operator	
3) Once on the ground, retreat from the vehicle by shuffling feet without breaking contact with the ground, for minimum 6 meters away from machine	Operator	
4) Notify ERTL	Supervisor	
5) Secure the scene if safe to do so, do not let any person approach machine	ERTL/Supervisor	
6) Contact the relevant power utility immediately to disconnect the power	ERTL/Supervisor	
7) If it is safe to do so, electrical fires may be suppressed using Class C fire extinguishers. This includes carbon dioxide and dry powder extinguishers. Before any attempt at fire suppression, make sure the electricity has been turned off. If unsure, do not approach the fire.	ERTL/Supervisor	
8) Contact emergency services 000 if required	ERTL/Supervisor	
9) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
10) Ensure notification and reporting process completed as per table	Project Manager or delegate	
11) Power utility representative to advise if machine safe for use	Power Authority	

Emergency Response Management Plan

Western Paddock Remediation



Bomb Threat	Responsible person	Check
REMEMBER: The use of Mobile Phones or Two Way Radios should be avoided until the Police have declared the site safe.		
WRITTEN THREAT		
1) Retain all paper and envelopes to preserve evidence such as fingerprints, handwriting, post marks	Person receiving threat	
2) Notify ERTL	Person receiving threat	
3) Check muster point and evacuation route for suspicious objects, determine if alternative muster point required	ERTL	
4) Once cleared, evacuate personnel to muster point	ERTL	
5) Secure the scene if safe to do so	ERTL/Supervisor	
6) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
7) Ensure notification and reporting process completed as per table	Project Manager or delegate	
PHONE THREAT		
1) Keep caller on the line as long as possible, remain calm and listen closely to what the caller says. Attempt to converse with the caller to complete as much information of the Bomb Threat Report. Note: Appearing sympathetic and using a pleasant tone may extend the call	Call recipient	
2) Complete Bomb Threat checklist, whilst on phone if possible, or as soon as possible after before memory becomes affected	Call recipient	
3) When caller "hangs-up" do not hang up your phone at all	Call recipient	
4) Contact emergency services on 000 from another phone ASAP (not a mobile phone or radio)	Call recipient	
5) Notify ERTL	Call recipient	
6) Check muster point and evacuation route for suspicious objects, determine if alternative muster point required	ERTL	
7) Once cleared, evacuate personnel to muster point	ERTL	
8) Secure the scene if safe to do so	ERTL/Supervisor	
9) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
10) Ensure notification and reporting process completed as per table	Project Manager or delegate	
SUSPECT OBJECT		
1) Notify ERTL	Person discovering object	
2) Contact emergency services on 000 if required	ERTL	
3) Inspection of the escape route and muster point must be completed as the bomb may have been placed at the muster point instead of or as well as the declared location, determine if alternative muster point required	ERTL	
4) Evacuate personnel to muster point	ERTL	
5) Secure the scene if safe to do so	ERTL	
6) Upon arrival of Police they will assume control and utilise the Emergency Services as and when required	Police	
7) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
8) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation



Severe weather event: Lightning	Responsible person	Check
1) Obtain up-to-date information from BOM or Police, monitor local creeks/ drainage/ access roads/ road conditions	ERTL/ Supervisor	
2) Utilise the flash-bang method to determine the distance of the lightning strike	ERTL/ Supervisor	
3) Notify all personnel of approaching lightning storm	ERTL/ Supervisor	
4) For lightning activity estimated within 15 km the ERTL are to consider: <ul style="list-style-type: none"> Relocating operating plant that are operating at elevated levels (e.g. high dumps/ cranes) to less exposed locations Instructing tower crane operator to leave the operating cab Moving persons on the ground to indoors or inside heavy mobile plant and light vehicle cabins 	ERTL/ Supervisor	
5) For lightning activity detected within 10km the ERTL is to coordinate the following: <ul style="list-style-type: none"> Cease operating in the open and alert all personnel to seek shelter Remain sheltered for 30 minutes after the last thunder 	ERTL/ Supervisor	
6) If rubber tyred equipment is struck by lightning, park machine in a secure area for 24hours	Operator/Supervisor	
7) Secure the scene if safe to do so	ERTL/ Supervisor	
8) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
9) ERTL in liaison with the Project Manager will determine when it is safe to return to work.		
10) Ensure notification and reporting process completed as per table	Project Manager or delegate	
Severe weather event: Flooding/cyclone	Responsible person	Check
1) Obtain up-to-date information from BOM or Police, monitor local creeks/ drainage/ access roads/ road conditions	ERTL/ Supervisor	
2) Complete cyclone readiness checklist	ERTL/ Supervisor	
3) Ensure site is clear of loose material that may become airborne, if blasting operations underway ensure all equipment is not charged and secured before weather approaches	ERTL/ Supervisor	
4) Notify all personnel of approaching rains/ flood, ensure all personnel are sheltered in a safe location (hard top vehicle or building) Consider closing/ barricading access roads if affected	ERTL/ Supervisor	
5) ERTL/ PM to coordinate the requirements of the different cyclone alerts- Blue, Yellow, Red	Supervisor	
6) Secure the scene if safe to do so	ERTL/ Supervisor	
7) ERTL in liaison with the Project Manager will determine when it is safe to return to work		
8) Site inspection to be conducted by the ERTL, Project Manager and HSE personnel	ERTL, Project Manager and HSE	
9) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
10) Ensure notification and reporting process completed as per table	Project Manager or delegate	
Seismic/Earthquake Event	Responsible person	Check
1) Shelter until seismic event ceased, evacuate building if safe to do so, account for all personnel	ERTL/ Supervisor	
2) If missing persons or emergency treatment required, call emergency services, call 000	ERTL/ Supervisor	
3) Contain any fires if safe and trained, do not try to extinguish any gas fires unless gas can be isolated.	ERTL/ Supervisor	

Emergency Response Management Plan

Western Paddock Remediation



4) Give first aid to casualties, remain with injured person(s) if safe to do so	First Aider	
5) Be aware of the possibility of ruptured underground services such as gas and sewer and manage these risks accordingly.	ERTL/ Supervisor	
6) Secure the scene if safe to do so	ERTL/ Supervisor	
7) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
8) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation



Excavation Collapse	Responsible person	Check
Minor Collapse		
1) Notify ERTL	Worker	
1) Evacuate all persons from the excavation, account for all persons	ERTL/ Supervisor	
2) If missing persons or emergency treatment required, call emergency services, call 000	ERTL/ Supervisor	
3) Assess the stability of the remaining walls	ERTL/ Supervisor	
4) If safe to do so and not causing further injury to person or other workers, or injured person is at risk of further harm as a result of further excavation collapse, assist injured person out of trench to a safe area.	ERTL/ Supervisor	
5) Secure the scene if safe to do so	ERTL/ Supervisor	
6) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
7) Ensure notification and reporting process completed as per table	Project Manager or delegate	
Major Collapse		
1) Notify ERTL	Worker	
2) If missing persons or emergency treatment required, call emergency services, call 000	ERTL/ Supervisor	
3) Assess the stability of the remaining walls	ERTL/ Supervisor	
4) Demarcate suspected area where person engulfed.	ERTL/ Supervisor	
5) If person partially / fully engulfed and If safe to do so, commence hand digging only - no machines to be used. Maintain a spotter whilst extracting trapped persons.	ERTL/ Supervisor	
6) Once person found assess condition of injured person. Do not fully remove injured person from engulfment until confirmation received from emergency services.	ERTL/ Supervisor	
7) Secure the scene if safe to do so	ERTL/ Supervisor	
8) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
9) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

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Fall from Height	Responsible person	Check
1) Notify ERTL	Worker	
2) Call emergency service urgently 000	ERTL/ Supervisor	
3) Determine rescue method (rope rescue, crane with man cage, cherry picker etc.)	ERTL/ Supervisor	
4) Encourage the suspended person to try to move their legs, shift their weight from one leg to another, try to raise legs as high as possible, try to lower head as much as possible	ERTL/ Supervisor	
5) Retrieve person from height as soon as possible <5 minutes	ERTL/ Supervisor	
6) Give person first aid (procedure for transferring a suspended person to the horizontal position in stages; first to a kneeling position, then to a sitting position, finally to a horizontal position over a period of approximately 30-40 minutes)	First Aider	
7) Secure the scene if safe to do so	ERTL/ Supervisor	
8) Notify Project Manager, Site HSE Representative	ERTL/Supervisor or delegate	
9) Ensure notification and reporting process completed as per table	Project Manager or delegate	

Emergency Response Management Plan

Western Paddock Remediation



Appendix 3- Situation Report

Name of Site ERTL:		Time of call:		AM/PM
Contact Number:		Alternate Contact Number:		
Incident Location:				
Time of Incident:	AM/PM	Local time (if diff from Perth):	AM/PM	
NATURE OF INCIDENT				
What happened/is happening?				
What is the confirmed or likely cause?				
What functions or equipment is affected?				
PERSONNEL				
Have there been any injuries to employees or third parties? If so, what type and how many?				
What is the status of the people affected?				
Have they been transported to hospital? If so, where?				
Has the injured person family been contacted?				
Are the affected personnel Georgiou employees or subcontractors? Has the subcontracting company been contacted?				
Have personnel been evacuated? If so, where to?				
SCOPE OF THE INCIDENT				
What other impacts are there? E.g. local community, general public, neighbours				
Have the affected members of the community been assisted with relocation or other support offered? Will this be necessary now?				
Is there any assistance required? YES / NO				
Details:				
RESPONSES CURRENTLY UNDERWAY				
What action is being taken?				
Are the police or other authorities at the scene?? YES / NO				
Is the media at the scene? Who?				
Media enquiries/coverage? If so, by Whom?				
Has anyone spoken with the media? If so Who?				
What were the questions and answers?				
OPERATIONS				
Can normal project operations continue? YES / NO				
Name of Emergency Response Member taking/making call:				

Emergency Response Management Plan

Western Paddock Remediation



Appendix 5- Offender Description Report

Time of incident _____ ☐ AM ☐ PM Date: _____

Location of incident: _____

Nature of incident: _____

GENERAL DESCRIPTION

Suspect Person:

Previously Observed: ☐ YES ☐ NO Where / When: _____

Last sighted: _____ Direction of travel: _____

Facial	Hair colour	Hair style	Eye colour	Build	Appearance	Complexion
<input type="checkbox"/> Moustache	<input type="checkbox"/> Blonde	<input type="checkbox"/> Short	<input type="checkbox"/> Blue	<input type="checkbox"/> Thick	<input type="checkbox"/> Caucasian	<input type="checkbox"/> Blotchy
<input type="checkbox"/> Beard	<input type="checkbox"/> Fair	<input type="checkbox"/> Long	<input type="checkbox"/> Black	<input type="checkbox"/> Medium	<input type="checkbox"/> Asian	<input type="checkbox"/> Pale
<input type="checkbox"/> Clean shaven	<input type="checkbox"/> Light Brown	<input type="checkbox"/> Curly	<input type="checkbox"/> Brown	<input type="checkbox"/> Muscular	<input type="checkbox"/> Southern European	<input type="checkbox"/> Medium
Voice	<input type="checkbox"/> Brown	<input type="checkbox"/> Straight	<input type="checkbox"/> Green	<input type="checkbox"/> Solid	<input type="checkbox"/> African	<input type="checkbox"/> Olive
<input type="checkbox"/> Male	<input type="checkbox"/> Red	<input type="checkbox"/> Balding	<input type="checkbox"/> Hazel	<input type="checkbox"/> Obese	<input type="checkbox"/> Islander	<input type="checkbox"/> Dark
<input type="checkbox"/> Female	<input type="checkbox"/> Black	<input type="checkbox"/> Bald	<input type="checkbox"/> Grey		<input type="checkbox"/> Indigenous Australian	<input type="checkbox"/> Freckles
<input type="checkbox"/> Accent						

Other	Clothing	Age:	Description:
<input type="checkbox"/> Scars	Upper garments: _____		
<input type="checkbox"/> Marks			
<input type="checkbox"/> Tattoos	Lower garments: _____	Height: _____	
<input type="checkbox"/> Piercings			

VEHICLE DESCRIPTION

Make	Type	Colour	Registration:	Model:	Approximate year:
<input type="checkbox"/> Ford	<input type="checkbox"/> Sedan	<input type="checkbox"/> White			
<input type="checkbox"/> Holden	<input type="checkbox"/> Station wagon	<input type="checkbox"/> Silver			
<input type="checkbox"/> Toyota	<input type="checkbox"/> Coupe	<input type="checkbox"/> Red			
<input type="checkbox"/> Mazda	<input type="checkbox"/> Utility	<input type="checkbox"/> Green			
<input type="checkbox"/> Honda	<input type="checkbox"/> Van	<input type="checkbox"/> Blue			
<input type="checkbox"/> Hyundai	<input type="checkbox"/> Other	<input type="checkbox"/> Black			
<input type="checkbox"/> Other		<input type="checkbox"/> Other			

Other vehicle features: _____

TYPE OF THREAT

Physical	Weapon	Verbal - wording of threat:
<input type="checkbox"/> Push	<input type="checkbox"/> Firearm	_____
<input type="checkbox"/> Punch	<input type="checkbox"/> Knife	_____
<input type="checkbox"/> Kick	<input type="checkbox"/> Instrument	_____
<input type="checkbox"/> Other	<input type="checkbox"/> Other	_____

WITNESS / VICTIM DETAILS

Name (print): _____ Signature: _____

Phone number: _____

Appendix 6- Bomb Threat Report

Write down the exact wording of the THREAT

Remember - Keep calm and don't hang up

Bomb Threat Checklist - Questions to Ask

1. When is the bomb going to explode?	_____	7. Did you place the bomb?	_____
2. Where did you put the bomb?	_____	8. Why did you place the bomb?	_____
3. When did you put it there?	_____	9. What is your name?	_____
4. What does the bomb look like?	_____	10. Where are you?	_____
5. What kind of bomb is it?	_____	11. What is your address?	_____
6. What will make the bomb explode?	_____		

Is the Threat, Chemical, Biological or Radiological?

What kind of chemical is in it? _____

How much is there? _____

How will it be released? _____

Is it a liquid, powder or gas? _____

DETAILS OF CALLER

Callers voice

Accent (specify): _____

Any impediment (specify): _____

Voice (loud, soft, etc.): _____

Speech (fast, slow, etc.): _____

Diction (clear, muffled): _____

Manner (calm, emotional, etc.): _____

Did you recognise the voice? _____

If so, who do you think it was? _____

Was the caller familiar with the area? _____

Background noise

Street noise: _____

House noises: _____

Aircraft: _____

Voices: _____

Local call: _____

Long distance call: _____

Music: _____

Machinery: _____

Other: _____

Threat Language

<input type="checkbox"/> Well spoken	<input type="checkbox"/> Taped
<input type="checkbox"/> Incoherent	<input type="checkbox"/> Message read by caller
<input type="checkbox"/> Irrational	<input type="checkbox"/> Abusive

Other: _____

Time of phone call: _____

Date: _____

Duration of call: _____

Your Number called: _____

Other

Sex of caller: _____

Estimated age: _____

Your name: _____

Telephone number: _____

Signature: _____

Report call immediately to 000, use another phone

APPENDIX 6

Contractor Stormwater Management Plan

**Midland Western Paddock Remediation – Storm Water Run-
Off Methodology**

CONTRACT 237550-00


Storm Water Run-Off Control Plan

Methodology

(QA-MS-002)

June 2015 (Rev 0)

Rev	Prepared	Reviewed	Approved	Date	Description
0	Thomas Flynn – Senior Engineer	Georgiou Site Management	Thomas Flynn – Senior Engineer	12-06-15	
1					
2					

 Midland Western Paddock Remediation	1552– Stormwater Run-off METHODOLOGY
	Contract 237550-00 Midland Western Paddock Remediation - Stormwater Run-off Methodology

APPROVAL & AUTHORIZATIONS

Title: Method Statement – Midland Western Paddock – Stormwater Run off Method			
Document №: QA-MS-001		Revision: 0	Date: 12/06/2015
Description: Earthworks			
Originator (Georgiou):	Print Thomas Flynn	Sign:	Date: 09/6/15
Review and Approval (Arup):	Print:	Sign:	Date:
Review and Approval (MRA):	Print:	Sign:	Date:

Approval of the construction Method Statement and any additional control Procedures listed therein where applicable must be completed prior to work commencing.

Midland Western Paddock Remediation

**CONSTRUCTION
METHODOLOGY STATEMENT**

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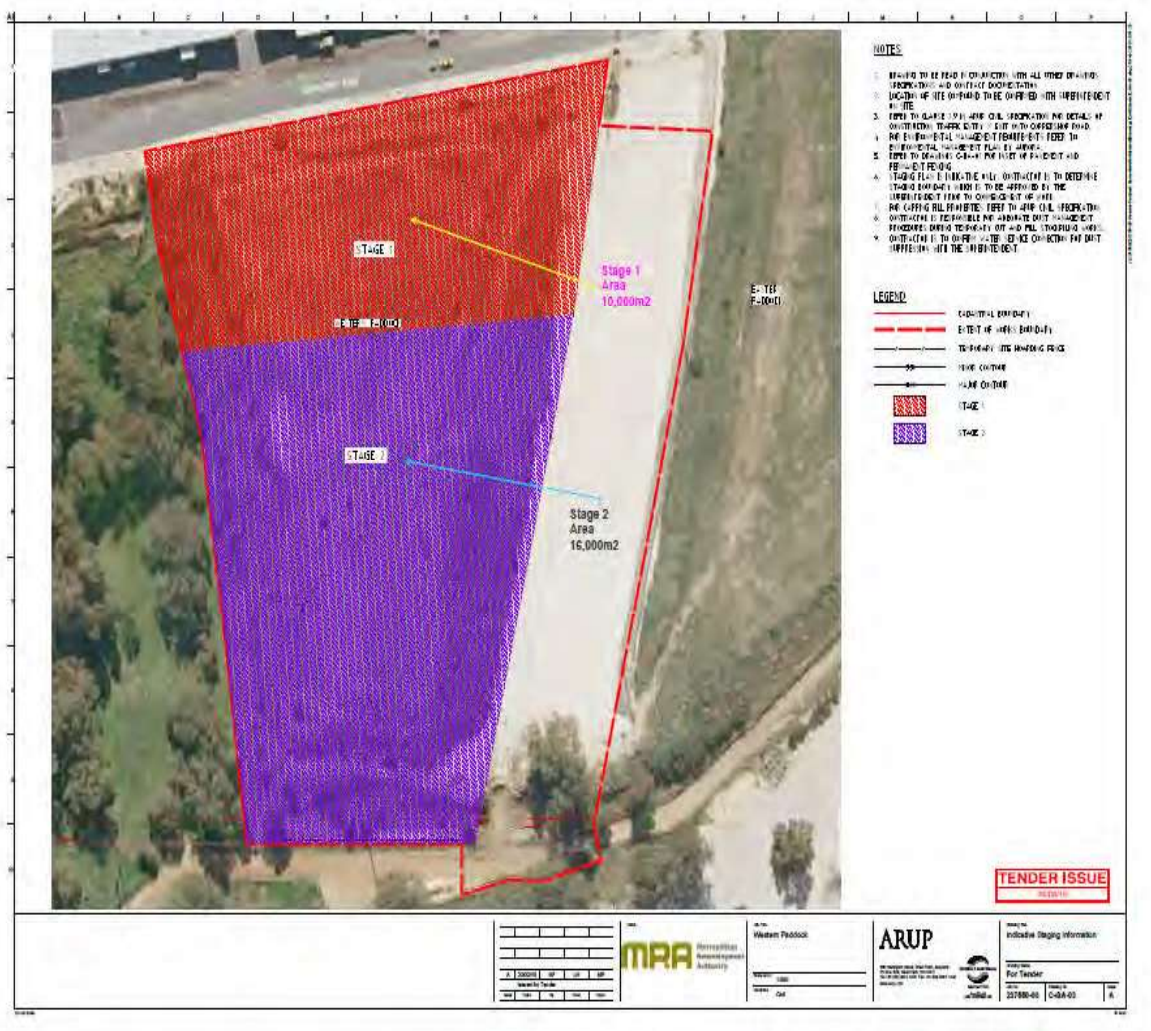
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- **PDF Attachment separate – Stormwater run-off drain control Plan**

Location of Site




Construction Staging Plan – Earthworks Stripping and Cut to Fill



Construction Staging Plan – Stockpiles For Classification Testing



 Midland Western Paddock Remediation	1552– Stormwater Run-off METHODOLOGY
	Contract 237550-00 Midland Western Paddock Remediation - Stormwater Run-off Methodology

Method Statement

1.0 Preliminaries

1.1 Introduction & Objective

The objective of the Western Paddock Remediation Stormwater methodology is to detail and specify the procedures, processes and methods to be employed for the construction of the Stockpile remediation, as part of Western paddock Remediation Works to control stormwater run-off.

1.2 Scope of Work

The project will consist of bulk earthworks, re-profiling of pre-classified contaminated material onsite and importation of clean fill to form a capping layer. Locating and if applicable Protection of existing services, reinstatement of existing ground conditions and storm water run-off management during works.

1.3 Relevant Documents

Georgiou Workplace Inspection Checklist
Georgiou Procedure for locating services
Georgiou Risk Assessment and HSE Management Plan
Georgiou Procedure for working in vicinity of existing services
Aurora Environmental Management Plan
Statutory regulations for working near existing services
Ministerial Statement 612

1.4 Definitions

Stakeholders – Adjacent Property Owners
Aurora – Environmental Consultant
MRA – Metropolitan Redevelopment Authority
Superintendent - Arup
Contractor - Georgiou
Ministerial Statement 612 – Approval by the minister for Environment
Service Providers – Telstra/Western Power/Atco Gas

Ref: – Midland Western Paddock Stormwater Run-off methodology File: 1552-02-06-Management Plans	Page 7 of 11
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2.1 Safety & Environmental Controls (Pre-Construction)

Item	Hazards	Control
1.	Approval to commence	<p>-The soil in the Western Paddock consists of fill excavated from the Midland Railway site and is contaminated with low levels of heavy metals, Asbestos containing materials and Friable asbestos.</p> <p>The following Controls will be put in Place to protect Run-Off :</p> <ul style="list-style-type: none"> - Daily Pre-Start meetings; - Traffic Management plans in place, with adequate signage requirements adhered to; - Spotters to be used where applicable; - Pre-plan load & haul, place and compact activities. - Supervisor and or Dozer/Loader/Excavator operator to do a pre work inspection of work area and Plant <p>Earth Bunds and Channel/Dish drains will be constructed to catch water run-off from the stockpile.</p>
2.	Material transport & delivery	<ul style="list-style-type: none"> - Traffic Management Plan & Traffic Control Diagrams; - Planning & pre-determined haul roads - Spotters to be used where applicable - Supervisor and or Dozer/Loader/Excavator operator
3.	Dust/Environmental Control	<ul style="list-style-type: none"> - Use of water-carts as required on haul roads and access roads; - Reduce speed of heavy vehicles & light vehicles as required; - Drive-to conditions. - Aurora Environmental Management plan - Wheel Wash at Site Entrance – Road sweeping, dust bags, may be used at the entrance to maintain Coppershop road and limit soil/dust impact from site - Limit Areas of cut to fill activities and stockpiles - Limit Areas where vehicles can drive and only Georgiou vehicles approved by Site Supervisor to drive on site - Supervisor to inspect the drains every morning prior to commencing works and evening just prior to end of work day. This will be documented in the supervisors daily Pre-start and or daily site inspection sheet. <p>Supervisor to check the BOM website daily for the weeks</p>

		forecast and have controls in place to deal with potential rain fall prior.
4.	Drains constructed in the Vicinity Power lines/gas line and other obstructive areas	<ul style="list-style-type: none"> - Working within the vicinity of overhead power lines risk assessment - Identify underground and overhead services. - Identify if there is a need to work in the vicinity of power lines adjacent to work area; - In the event where it is necessary to be working within the vicinity of power lines the Georgiou Procedure for working within the vicinity of powerlines and the power companies policy/Worksafe policy for working near overhead powerlines will be followed. Permits will be approved prior. -Flag/ highlight boundary near the unauthorized areas - Traffic Management Plan & Traffic Control Diagrams;

2.2 Construction of Drains and Controls

1.	Setting out Channel Drain Construction	<p>The Surveyor will set out the proposed alignment of the channel drains at the toe of the Western Stockpile .This will ensure that the drains do not clash with the existing services that are already located and physically identified.</p> <p>The Surveyor and Supervisor will check to ensure that the proposed drains do not interfere with the Swan drainage easement on the West side of the stockpile and that they are within the perimeter Boundary of site works. Refer to Plan above section 2.0 or PDF Attachment.</p>
2.	Construct Channel Drain	<p>The Swampy D6 or Excavator will cut out the channel drain and stockpile the material to one side The Channel will be approx. 300mm-500mm Deep. The run-off from the spray of the water cart or from storm water will run down the slopes of the stockpile and into the channel drain which act as a Temporary catchment. . Refer to Plan above section 2.0 or PDF Attachment.</p>
3.	Construct Earth Bund	<p>The material cut from the channel and stockpiled will be shaped to form the earth bund approx. 0.5m High. This will prevent any run-off leaching outside the site boundary if there is an overflow in the channel drain. .</p>

		Refer to Plan above section 2.0 or PDF Attachment.
4.	Temporary Settlement Pond	A temporary settlement pond will be constructed using earth bunds and will act as a storage area if the channel drains overflow. The Storm water will either flow naturally to this area or it will be pumped using a 2" hose layflat and pump. The Pond will be located on the east side of the Stockpile near the stage 2 stockpile area where the stripped vegetation/cut material will be tested. refer to construction staging plan stockpiles page 6 above.
5.	Rehabilitation	The drains and bunds will be left as is for future run-off controls.

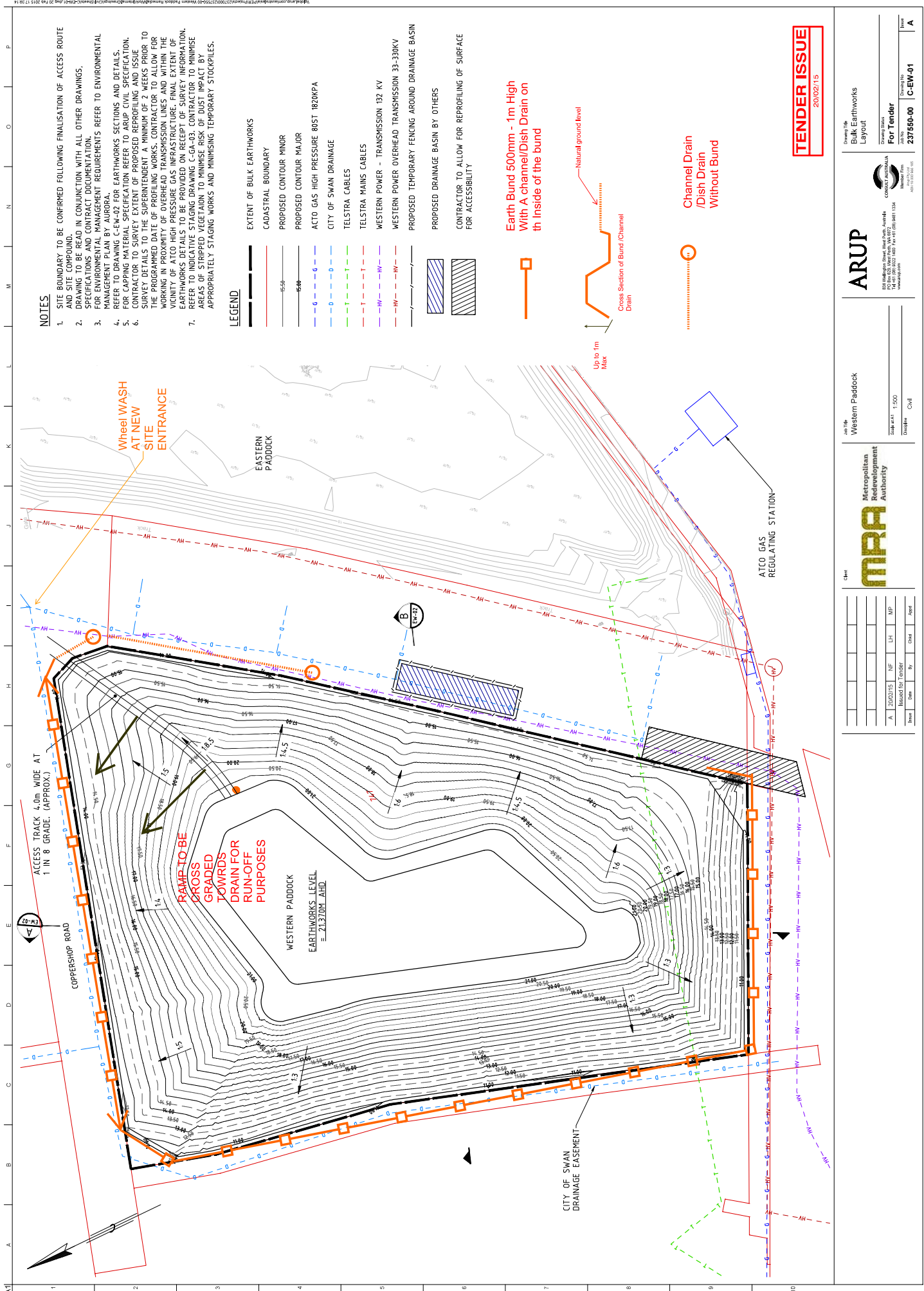
2.3 Reason for Drains and Controls

The channel drains and bunds will be used to control any potential water run-off, contamination and sedimentation during the earthworks construction and remediation of the existing western stockpile.

The drains will act as catchment around the perimeter of the stockpile and prevent any run-off to nearby infrastructure or land and will minimize impact of the remainder of the construction site and existing services access road that runs through the area.

The water caught in the drains or stored in the sediment pond will be re-infiltrated through the existing stockpile prior to the geotextile and capping layer being placed.

The construction of drains will have no effect on the existing City of Swan drainage easement or infrastructure. If any need arises to encroach or use city of Swan drains or infrastructure Georgiou will liaise with the City of Swan and the Superintendent prior to undertaking any works.



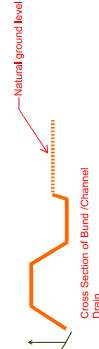
NOTES

- 1. SITE BOUNDARY TO BE CONFIRMED FOLLOWING FINALISATION OF ACCESS ROUTE AND SITE COMPOUND.
- 2. DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS, SPECIFICATIONS AND CONTRACT DOCUMENTATION.
- 3. ENVIRONMENTAL REQUIREMENTS REFER TO ENVIRONMENTAL MANAGEMENT PLAN BY AUSTRALIAN GOVERNMENT.
- 4. REFER TO DRAWING C-EW-02 FOR EARTHWORKS SECTIONS AND DETAILS.
- 5. FOR CAPPING MATERIAL SPECIFICATION REFER TO ARUP CIVIL SPECIFICATION.
- 6. SURVEY DETAILS TO THE SUPERINTENDENT A MINIMUM OF 2 WEEKS PRIOR TO THE PROGRAMMED DATE OF PROFILING WORKS. CONTRACTOR TO ALLOW FOR WORKING IN PROXIMITY OF OVERHEAD TRANSMISSION LINES AND WITHIN THE VICINITY OF ATCO HIGH PRESSURE GAS INFRASTRUCTURE. FINAL EXTENT OF EARTHWORKS DETAILS TO BE PROVIDED ON RECEIPT OF SURVEY INFORMATION.
- 7. REFER TO INDICATIVE STAGING DRAWING C-GA-03. CONTRACTOR TO MINIMISE AREAS OF STRIPPED VEGETATION TO MINIMISE RISK OF DUST IMPACT BY APPROPRIATELY STAGING WORKS AND MINIMISING TEMPORARY STOCKPILES.

LEGEND

- EXTENT OF BULK EARTHWORKS
- CADASTRAL BOUNDARY
 - PROPOSED CONTOUR MINOR
 - PROPOSED CONTOUR MAJOR
 - ACTO GAS HIGH PRESSURE 60ST 1820KPA
 - CITY OF SWAN DRAINAGE
 - TELSTRA CABLES
 - TELSTRA MAINS CABLES
 - WESTERN POWER - TRANSMISSION 132 KV
 - WESTERN POWER OVERHEAD TRANSMISSION 33-330KV
 - PROPOSED TEMPORARY FENCING AROUND DRAINAGE BASIN
 - PROPOSED DRAINAGE BASIN BY OTHERS
 - CONTRACTOR TO ALLOW FOR REPROFILING OF SURFACE FOR ACCESSIBILITY

Earth Bund 500mm - 1m High
With A channel/Dish Drain on
th Inside of the bund



Channel Drain
/Dish Drain
Without Bund

TENDER ISSUE
20/02/15

Client

Metropolitan
Redevelopment
Authority

ARUP

Western Paddock

Bulk Earthworks
Layout

For Tender

237550-00 C-EW-01

Issue	Date	By	Checked	Appr
A	20/02/15	INF	LH	MAP

Based for Tender

Scale 1:1 1:500

Drawn By

Checked

Client

APPENDIX 7

Contractor Construction Management Plan

CONSTRUCTION MANAGEMENT PLAN

	Site Details
Client:	Metropolitan Redevelopment Authority (MRA)
Site Name:	Western Paddock Remediation
Project Number:	1552
Project Commencement Date:	TBA
Estimated Project Completion Date:	TBA
Issue Date:	Jun 2015
Document ID Code:	1552-HSE-MP-?????

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Construction Management Plan

Western Paddock Remediation



Version	Date	Revision Details	Compiled by	Corporate HSE Representative	Project Manager	PM Line Manager
1	12/6/15	Initial Draft	R. Rossi	Name: Paul Dickenson Signature:	Name: Steve Faulkner Signature:	Name: Dene Hyde Signature:
				Name: Signature:	Name: Signature:	Name: Signature:
				Name: Signature:	Name: Signature:	Name: Signature:
				Name: Signature:	Name: Signature:	Name: Signature:
				Name: Signature:	Name: Signature:	Name: Signature:

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1. INTRODUCTION AND PURPOSE

The purpose of this Management Plan is to describe how health and safety risks and environmental aspects are to be managed so that the site and those engaged onsite will:

- Comply with Georgiou Policy and legal and other obligations;
- Minimise the impacts on the health and safety of workers;
- Minimise the impacts on the environment;
- Achieve the Company, client and site objectives and targets.

This Management Plan is written in accordance with Georgiou's health, safety and environment management system that is 3rd party certified to AS/NZS 4801, AS/NZS ISO 14001 and the Australian Building and Construction Occupational Health and Safety Accreditation Scheme (Federal Safety Commission). The development of this Management Plan has been based upon the risks and opportunities identified and specifically address client, contractual, legal and other obligations.

1.1 Amendments and Authorisation

This Management Plan shall be approved by the Project Manager, their Line Manager and a Representative from the HSE Department.

This Management Plan and other related documents will be reviewed annually or as a result of:

- Changes to Company procedures or processes;
- Changes to key personnel or resources;
- Changes in legal and other obligations;
- Findings from an audit or inspection;
- Findings from a significant incident or near miss;
- Significant changes to site conditions and/or work methods
- Instructions from the Metropolitan Redevelopment Authority or the OSH Committee if established.

Reviews shall be undertaken in consultation with key stakeholders to ensure all work locations and impacts are considered. A record of the date and comments relating to any revisions of this document shall be included in the revision table.

The only Georgiou authorisation required to amend this document after initial approval is the Project Manager's.

1.2 Communication of Plan

The Project Manager is accountable for ensuring:

- Location and access to the management plans will be communicated at induction
- Site communication forums will also be used to communicate specific requirements of the plans
- Any changes made to the Management Plan are communicated to all affected persons on the site

2. SCOPE OF WORKS

This Management Plan has been prepared for the Metropolitan Redevelopment Authority. The scope of works includes the following activities:

- Vegetation stripping
- Topsoil stripping
- Re-grading Stockpile
- Installation of Geogrid

- Clean fill Capping
- Replace vegetation & monitor
- Install access to stockpile for maintenance

Estimated project mobilisation date of 22nd June 2015 and estimated completion date of 21st August 2015.

This site will operate between 0700 hours to 1630 hours Monday to Thursday, 0700 hours to 530 hours Friday and 0700 hours to 1330 hours Saturday. Expected construction period is 7 weeks.

Site will be fenced to prevent unauthorised entry.

Staff parking will be allocated inside compound and workers and visitor's personal vehicles will have a safe parking facility outside of the compound once the compound has been established.

2.1 Site Deliveries

All deliveries will come to the main office compound through a gate off Coppershop road. There will be no queuing issues on Coppershop Road. Any large items are to be unloaded in a dedicated area in the compound where Georgiou personnel will place any necessary items into a selected laydown area.

2.2 Environmental Setting

2.2.1 Landform and Climatic Conditions

- Summers are generally hot and dry, lasting from December to late March, with February generally being the hottest month of the year, while winters are relatively mild and wet, making Perth a classic example of a Mediterranean climate. Summer is not completely devoid of rain with sporadic rainfall in the form of short-lived thunderstorms.
- The Project and surrounding area is relatively flat with no significant land forms.
- The site is located off Coppershop Road and is adjacent to a shopping precinct to the north, the Western Australian Police Services site to the west and is approximately 250m south of the Midland Health Campus.

2.2.2 Map of the Project Areas



- The above aerial photograph highlights the site location and the approximate site boundary

2.3 Community Communication and Consultation

At the planning stage potential community impacts and the potential issues that could arise as a consequence of Georgiou activities were identified. The controls to be implemented to minimise the impact on the community include:

- Communication notices i.e. letter drops to be arranged by MRA
- Consultation with Community Groups and Stakeholders by MRA
- Media Releases by MRA
- Dilapidation Surveys by Georgiou

All of the above will be managed by MRA (except Delap surveys) & any written forms of communication that are developed to be released to the community and contain the Georgiou name or logo must be approved by the Project Manager's Line Manager.

All communications received from external parties pertaining to the environmental aspects and impacts associated with the Site's works shall be documented and correspondence filed into the Document Management System (DMS). All community complaints shall be referred to the Project Manager or nominee or if neither of these are not available the most senior person on site. All complaints will be managed in accordance with section **Error!**

Reference source not found..

2.4 Site Fencing and Security

The Site will be secured to prevent unauthorised access. The site compound will be located inside and there will be no obstruction to the existing access road used by service providers.

3. HEALTH AND SAFETY HAZARD MANAGEMENT

3.1 Asbestos

Asbestos or Asbestos Containing Material (ACM) has been identified or is assumed present on site. An **Asbestos Management Plan** has been developed to set out how Asbestos will be managed. Refer to Asbestos Management Plan in Appendix 13a & 13b of this HSEMP.

4. ENVIRONMENTAL ASPECT MANAGEMENT

The following environment aspects have been identified for the Western Paddock Remediation within the site **HSE Risk Register**. An environmental sub-plan has been developed within this Management Plan to detail how the aspects will be managed to comply with relevant legislation & client requirements and identifies the controls and responsibilities to meet obligations. These Sub Plans establish an outline of how Georgiou will manage potential impacts to comply with relevant legislation requirements and identifies the controls and responsibilities to meet legally binding obligations.

4.1 Significant Environmental Aspects

- Soil/Materials Management
- Air Quality and Dust
- Asbestos
- Erosion and sediment

4.2 Environmental Aspects

- Waste
 - Water
 - Hydrocarbon and Chemical
 - Flora and Fauna
-

4.2.1 Working Environment

4.2.1.1 Occupational Noise

Workers will not be exposed to daily occupational noise levels higher than LAeq, 8h of 85 dB. If personnel are potentially exposed to hazardous levels of noise, controls will be implemented in the JHA/SWMS including but not limited to:

- Isolating people from the noise source
- Task rotation Provision of PPE and training in its correct use and care
- Double hearing protection (earmuffs and earplugs) in areas exceeding noise levels.

4.2.1.2 Vibration

If personnel are potentially exposed to hazardous levels of vibration, controls will be implemented in the JHA/SWMS which may include but not limited to:

- Task rotation
- Isolating people from the vibration source
- Adequate seat suspension in plant
- Provision of anti-vibration PPE

5. APPENDICES/ATTACHMENTS

- Appendix 1- Air Quality and Dust Sub Plan
- Appendix 2- Noise and Vibration Sub Plan
- Appendix 3a - Non Friable Asbestos Management Sub Plan
- Appendix 3b - Friable Asbestos Management Sub Plan
- Appendix 4 - Site Org Chart
- Appendix 5 - Work Staging Plan and Construction Methodology

Appendix 1 - Accountabilites and Responsibilities

Position	Name	Signature	Date
Project Manager			
Project Engineer			
Superintendent			
Supervisor			
HSE Advisor			

Construction Management Plan Western Paddock Remediation



Appendix 1- Air Quality & Dust Management Sub Plan			Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of the HSE Management Plan)		Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets		Project Manager
Mitigation Measures	General	Site related dust, identifiable fumes, odours and vapours will not infringe beyond site boundaries where practical This Sub Plan is deemed to be compliant with section 2.7 of the RFT document.	Project Manager
	Training and Competency	<ul style="list-style-type: none"> As part of the Site Induction, workers will be informed of the Site specific controls required for air quality and dust management including: <ul style="list-style-type: none"> - Correct use of PPE - Use of monitoring equipment - Methods to control dust 	Project Manager
	Greenhouse Gases	<ul style="list-style-type: none"> Regular maintenance of plant and equipment for optimum performance will be undertaken to keep emissions to a minimum and increase plant productivity. Maintenance of Plant and equipment will be in accordance with the Plant, Equipment and Vehicle Maintenance Procedure Vehicles and equipment must be fitted with appropriate emission control equipment and routinely maintained. Plant should be switched off when not in use, wherever practicable All plant, equipment and vehicles are to be regularly monitored and maintained and records kept of maintenance. Engine tampering to increase power output is prohibited Air emissions from plant, vehicles and equipment should be visually monitored throughout construction 	Project Manager
	Dark Smoke	<ul style="list-style-type: none"> All internal combustion engines will be regularly serviced to ensure optimum operation and minimise the volume of visible smoke emitted. Any Plant or light vehicles emitting unreasonable smoke (concentrations higher than normal operation) will cease operation and be serviced by a trained and qualified technician. Materials on site will not be burned intentionally without consulting and obtaining the authorisation of the relevant Local Shire, Fire Authority and Client. The burning of any material on site should be a last option after alternative methods have been considered. 	All
	Dust Monitoring	<p>The following dust monitoring methods will be applied on the Site:</p> <ul style="list-style-type: none"> Obtaining weather reports from the Bureau of Meteorology (BOM) website Visual inspection Dust monitors MRA will conduct PM10 dust monitoring and provide results and alarms to Georgiou for management action in accordance with alarm levels specified in the environmental specification. 	Project Engineer
	Contingency measures	Please refer to appendix 1A for contingency measures	Project Manager
	Dust Control	Dust control methods to be applied on the site to keep dust generated within the site boundaries, as	All

Construction Management Plan Western Paddock Remediation



Appendix 1 - Air Quality & Dust Management Sub Plan			Responsibility
		<p>reasonably practicable, will be:</p> <ul style="list-style-type: none"> - Application of water/dust suppressant via water carts - Hydro mulching to stabilise soils - Physical application of ground cover - Cessation of works in adverse weather conditions - Restricted speed limits on site - Reschedule dust generating activities to avoid adverse weather conditions - Communicate dust risk and mitigation measures to staff prior to commencing work - Wheel Wash for all vehicles exiting the project area - Periodic street sweeping if required 	
	Fumes, Odours and Vapours	<ul style="list-style-type: none"> ▪ The Site will endeavour to keep the generation of emission of unreasonable levels of fumes, odours and vapours to a minimum. Refer to the Waste Management Sub Plan and Hydrocarbon and Chemical Environmental Management Sub Plan which detail storage and handling controls that minimise fumes, odours and vapours. 	All
	Monthly (Documented)	<ul style="list-style-type: none"> ▪ Environmental inspections will be completed via ONEAPP 	Supervisor
Reporting	HSEQ Monthly Management Meeting		Project Manager

Construction Management Plan Western Paddock Remediation



Appendix 2- Noise and Vibration Management Sub Plan			Responsibility	
Objectives & Targets	<ul style="list-style-type: none">Refer to the Site HSE Objectives & Targets Document (section 3.2 of the HSE Management Plan)		Project Manager	
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets		Project Manager	
Mitigation Measures	General	<ul style="list-style-type: none">Compaction activities that have the potential to impact external stakeholders will consider:<ul style="list-style-type: none">Letter drops to local residentsStatic rollingOscillating compaction systemsReduced amplitude settingsPre & During Construction noise MonitoringExcessive noise hazard areas will be demarcated and adequately signed and entry only permitted to these areas when the required PPE is wornTask rotation may be employed where practicable and when carrying out long tasksAs part of the Site Induction, workers will be informed of the site specific controls required for noise and vibration management including:<ul style="list-style-type: none">Correct use of PPEPre-construction & During Construction Noise MonitoringConstruction work in residential areas will only be conducted between the hours of 7 am and 7 pm (WA) on days other than Sundays and public holidaysWork outside of these hours will require permission from the local government authority.Plant will be fitted with appropriate noise emission/vibration control equipmentPlant will be fitted with adequate seat suspensionPlant should be switched off when not in use, wherever practicableTasks using equipment that causes vibration to hands will be rotated at intervals to reduce exposureConsideration may be given to the use of anti-vibration PPEAll plant, equipment and vehicles are to be regularly monitored and maintained and records kept of maintenanceAny abnormalities in expected noise or vibration emissions will be recorded in the plant’s log book and reported to the plant department.Where there is a potential for noise/vibration to effect external stakeholders the site will consider the use of onsite monitorsEnvironmental inspections will be completed via ONEAPP	Project Manager	
	Training and Competency			
	Hours of Operation		Project Manager	
	Plant, Equipment & Vehicles		Plant Department	
	Monitoring		Project Engineer	
	Monthly (Documented)		Supervisor	
	Reporting Objectives &	HSEQ Monthly Management Meeting		Project Manager
		<ul style="list-style-type: none">Refer to the Site HSE Objectives & Targets Document (section 3.2 of this Plan)		Project Manager

Construction Management Plan Western Paddock Remediation



Appendix 2- Noise and Vibration Management Sub Plan				Responsibility
Targets				
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & Targets			Project Manager
		Training and Competency	<ul style="list-style-type: none"> Workers will be informed of the Site specific controls required for weed, pest and disease management including: <ul style="list-style-type: none"> pre-starts in weed and pest affected areas; location of weed infested areas to be avoided; Identification of weeds and pests & their associated classification. Pest control operators are to have qualifications. Where possible the preferred method of removal is by mechanical means where they will then be stockpiled separately from other non-infested topsoil/vegetation, removed from site and destroyed. Contact your local Shire for additional weed management strategies applicable to individual weed species. In the event that weeds are to be removed by chemical means Georgiou will contact the relevant local council to engage a qualified pest control operator. Qualifications will be obtained prior to commencing works onsite. If required flagging to be used and location communicated to personnel for avoidance. 	Project Manager
Mitigation Measures		Weed control measures		Project Engineer
		Feral Species/Vermin	If feral species/vermin are identified within the Site boundary Georgiou in consultation with the MRA may consider and propose measures to the control of feral animal movements along newly cleared construction areas which provide new access to sensitive environments.	Supervisor
		Monthly (Documented)	Environmental inspections will be completed via ONEAPP	Supervisor
Reporting		HSEQ Monthly Management Meeting		Project Manager

Construction Management Plan Western Paddock Remediation



Appendix 3a - Non-Friable Asbestos Management Sub Plan				Responsibility
Objectives & Targets	Refer to the Site HSE Objectives & Targets Document (section 3.2 of the HSE Management Plan)			Project Manager
Performance Criteria	100% Compliance with Client & legal requirements 100% achievement with Site Objectives & targets			Project Manager
		<p>If non-friable Asbestos is identified on site it will be managed as follows:</p> <ul style="list-style-type: none"> Areas containing non-friable asbestos will be quarantined, including from the public and communicated to all persons working on a site An asbestos register will be maintained in the Site's Master Safety Register and be readily accessible to all personnel who carry out or intend to carry out work <p>This Asbestos Register will record:</p> <ul style="list-style-type: none"> identified non-friable asbestos in the workplace the date the non-friable asbestos was identified the location and condition of the asbestos 		Project Manager
	Planning			
	Training and inductions	<p>As part of the Site Induction, workers will be informed of the Site specific controls required for management non-friable asbestos in soil:</p> <ul style="list-style-type: none"> Site access restrictions Correct use of PPE Decontamination procedures Use of monitoring equipment Waste handling procedures <p>Dust control measures and performance measures</p>		HSE Advisor
	Access Restrictions	<ul style="list-style-type: none"> Signs and barriers will be erected to warn of the danger and to prevent unauthorised people entering areas where asbestos contaminated fill material is being excavated/ handled. The location and extent of any access control areas will be agreed in discussion between the Project Manager, Project Engineer, HSE Advisor and the Environmental Coordinator and will be established in accordance with NOHSC:2002 (2005) Code of Practice for the Safe Removal of Asbestos (2nd Ed.) guidelines. Potential entry points to the asbestos work area should be signposted or labelled in accordance with AS 1319 (1994) Safety Signs for the Occupational Environment and NOHSC: 2002 (2005b). 		Project Manager
	Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> Only personnel with appropriate personal protective equipment (PPE) and training will be allowed to work inside the asbestos work area. In addition to hard hats, safety boots, safety glasses and hearing protection, the minimum protective equipment worn for personnel will be disposable overalls, gloves and a powered air-purifying respirator. The filter type within the respirator should be Class P2, as stipulated in the Code of Practice for 		Project Manager

Construction Management Plan Western Paddock Remediation



Appendix 3a - Non-Friable Asbestos Management Sub Plan			Responsibility						
		<ul style="list-style-type: none">the Safe Removal of Asbestos (NOHSC, 2005).Heavy vehicle and excavation equipment will be fitted with air-conditioned cabins. Where this is not possible, operators will be required to wear PPE as specified above.All contaminated materials, including cleaning rags, plastic sheeting and PPE etc, must be disposed of as asbestos waste (NOHSC, 2005).All soils and waste, will be disposed of by a licenced sub-contractor at an appropriately licenced landfill with requirements of the Waste Management Sub Plan and Materials Tracking System implemented (see Appendix 2).	Project Manager						
	Decontamination		Project Manager						
	Waste Management		Project Manager						
	Dust Control	<p>Dust control measures are required to conform to DER guidelines (DEC, 2011) which include the following measures:</p> <ul style="list-style-type: none">Movement of excavated soil will be minimised to prevent dust generation and maintained under damp conditions.Earthworks will be undertaken in stages to avoid the creation of large areas of disturbance, which represent a source of dust emissions.Water carts will be available.Watering will be conducted using water trucks and impulse sprinklers may also be considered as required. Watering will be conducted at the following areas:<ul style="list-style-type: none">Sites undergoing excavations.In areas being excavated / remediated, the application of water will be controlled to prevent ponding or run-off occurring.Uncovered, short-term stockpiles.On all internal access tracks and machinery storage areas.Regular maintenance checks of dust suppression equipment will be conducted to ensure effective operation.Internal access tracks will be hard surfaced and appropriate speed limits will be imposed to reduce dust generation.Internal tracks will be wetted down to minimise dust generation in transport areas. Water will be applied to the access tracks in the morning prior to each day or activity. Additional water will be applied to the tracks throughout the day, as required.MRA will conduct PM10 dust monitoring and provide results and alarms to Georgiou for management action in accordance with alarm levels specified in the environmental specification.	Project Manager						
	Contingency Measure	<table><tr><th>Alarm Type</th><th>Trigger Value</th><th>Management Response</th></tr><tr><td>1 hour average Corrective Action Alert</td><td>800</td><td><ul style="list-style-type: none">Notification sent to the Contractor's site supervisor's</td></tr></table>	Alarm Type	Trigger Value	Management Response	1 hour average Corrective Action Alert	800	<ul style="list-style-type: none">Notification sent to the Contractor's site supervisor's	Project Manager
Alarm Type	Trigger Value	Management Response							
1 hour average Corrective Action Alert	800	<ul style="list-style-type: none">Notification sent to the Contractor's site supervisor's							

Construction Management Plan Western Paddock Remediation



Appendix 3a - Non-Friable Asbestos Management Sub Plan			Responsibility
	(Indicative of a short period of elevated dust emissions that if allowed to persist may result in exceedances of the statutory particulate criteria)		<ul style="list-style-type: none"> mobile phone Site supervisor to immediately evaluate conditions and implement contingency measures as specified in the agreed Dust Management Plan
	24 hour average Corrective Action Alert. (Indicative of prolonged periods of dust emission that may result in exceedances of the statutory particulate criteria)	40	<ul style="list-style-type: none"> Alarm notification sent to Contractor's site supervisor's mobile phone Site supervisor to immediately evaluate conditions and implement contingency measures
	1 hour average Alarm (Indicative of a short period of elevated dust emissions that if allowed to persist will almost certainly result in exceedances of the statutory particulate criteria)	1000	<ul style="list-style-type: none"> In addition to SMS alarm to the site supervisor, SMS is also sent to the site environmental superintendent who will require immediate action to control dust or cessation of work. If condition persists for more than 3 hours, then work to cease on site
	24 hour average Alarm (Indicative of prolonged periods of dust emission that will almost certainly result in exceedances of the statutory particulate criteria)	50	<ul style="list-style-type: none"> In addition to SMS alarm to the Contractor's site supervisor, SMS is also sent to the environmental superintendent who will require immediate action to control dust or cessation of work. Dust controls for the site to be re-evaluated and upgraded as required to prevent a

Construction Management Plan Western Paddock Remediation



Appendix 3a - Non-Friable Asbestos Management Sub Plan				Responsibility							
			recurrence								
	Stockpile Contingency Measures	<p>Non-friable asbestos impacted waste will be excavated, stockpiled on plastic lining, tested and then placed into trucks and removed from the Site.</p> <p>In order to reduce potential impacts of stockpiles on surface water quality, all stockpiles will be placed at least 30m from surface water.</p> <ul style="list-style-type: none">Any temporary stockpiles of non-friable asbestos contaminated soil will be maintained under moist conditions.Stockpiled material will be disposed of off-site in accordance with the Landfill Waste Classification and Waste Definitions 1996 (as amended 2009) (DEC, 2009).In order to confirm that all contaminated soil has been removed, validation sampling beneath 'small' stockpiles (<20m³) will comprise one composite sample analysed for asbestos. Validation sampling beneath stockpiles of greater volume will be dictated by the footprint area of the stockpile and sampled in accordance with DER guidelines using systematic grid sampling strategy for asbestos.Validation samples from beneath stockpiles will be analysed for asbestos and compared against the nominated validation criteria.	Project Manager								
	Air Monitoring	<ul style="list-style-type: none">The applicable standards for monitoring asbestos are provided in Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres (NOHSC, 2005b), the Code of Practice for the Safe Removal of Asbestos (NOHSC, 2005a) and the Occupational Safety and Health Regulations 1996. The National Exposure Standard (NES) as established by the Australian Safety and Compensation Council (ASCC, formerly the NOHSC) is 0.01 fibres/mL of air measured using the membrane filter method for all forms of asbestos.Personnel MonitoringAirborne asbestos fibres will be monitored using personal air samplers at a number of locations within the excavation / subsurface disturbance area.The personal air samplers will be used in consultation with occupational testing procedures and sampling will operate on an 8hr cycle (8am-4pm) with samples being processed at an appropriately accredited laboratory on a 24hr/next working day turnaround. The results of this sampling will be used to determine compliance with asbestos exposure standards.The following 'Control Levels' will be adopted for the Project for personnel air monitoring for asbestos:<table><tr><td>Control Level (fibres/mL)</td><td>Control Action (fibres/mL)</td></tr><tr><td><0.01</td><td>Continue with adopted control measures</td></tr><tr><td>≥0.01</td><td>Review control measures</td></tr><tr><td>≥0.02</td><td>Stop subsurface disturbance works and find the cause</td></tr></table>	Control Level (fibres/mL)	Control Action (fibres/mL)	<0.01	Continue with adopted control measures	≥0.01	Review control measures	≥0.02	Stop subsurface disturbance works and find the cause	Project Manager
Control Level (fibres/mL)	Control Action (fibres/mL)										
<0.01	Continue with adopted control measures										
≥0.01	Review control measures										
≥0.02	Stop subsurface disturbance works and find the cause										

Construction Management Plan Western Paddock Remediation



Appendix 3a - Non-Friable Asbestos Management Sub Plan			Responsibility				
		<ul style="list-style-type: none">▪ Static Air Samplers<ul style="list-style-type: none">- Static air samplers will be strategically located on the boundaries of the work area to assess the effectiveness of controls within the excavation area.- Asbestos will be measured in accordance with the NOHSC's Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres (NOHSC, 2006) for the determination of airborne fibres.- In terms of protecting public health, the target background level within the three static air samplers will be the NATA collection and detection limit of 0.01 fibres/mL (10 times below the occupational limit). It is proposed that excavation work will cease while dust management procedures are reviewed if this target criteria is exceeded.- The static air monitors will operate on a 8hr cycle (8am-4pm) with samples being processed at an appropriately accredited laboratory on a 24hr/next working day turnaround. The results of this sampling will be used to determine compliance with asbestos exposure standards.- The following 'Control Levels' will be adopted for the Project for static air monitoring asbestos:<table><tr><th>Control Level (fibres/mL)</th><th>Work Stoppage Criterion (fibres/mL)</th></tr><tr><td><0.01</td><td>0.01</td></tr></table>▪ If for any reason static samples / personal monitoring samples fail to reach the laboratory in time, then samples will be analysed on a 48hr /two working day turnaround. The reason for failure to deliver the samples on the day will be required to be reported within 24hrs of becoming aware of the event.Once all subsurface excavation works have been completed, sampling for fugitive asbestos fibres will cease.	Control Level (fibres/mL)	Work Stoppage Criterion (fibres/mL)	<0.01	0.01	
Control Level (fibres/mL)	Work Stoppage Criterion (fibres/mL)						
<0.01	0.01						
Environmental Inspections & Monitoring	Daily (Documented)	Monitoring Carried out by the Environmental Consultant	Project Manager				
	Weekly (Documented)	Monitoring Carried out by the Environmental Consultant	Project Manager				
	Monthly (Documented)	DHI Environmental Inspection Carried out via OneApp	Project Manager				
Reporting	HSEQ Monthly Management Meeting		Project Manager				

Construction Management Plan

Western Paddock Remediation



Appendix 3b - Friable Asbestos Management Sub Plan			Responsibility
Objectives & Targets	<ul style="list-style-type: none"> Refer to the Site HSE Objectives & Targets Document (section 3.2 of the HSE Management Plan) 		Project Manager
Performance Criteria	<p>100% Compliance with Client & legal requirements</p> <p>100% achievement with Site Objectives & targets</p>		Project Manager
Management Measures		<p>If Friable Asbestos is been identified by the site air monitors or visually on site it will be managed as follows:</p> <ul style="list-style-type: none"> Areas containing Friable Asbestos will be quarantined, including from the public and communicated to all persons working on a site The Project Manager or delegate will consult/engage an appropriately licensed asbestos removalist to remove the asbestos from site in a lawful manner An asbestos register will be maintained in the Site's Master Safety Register and be readily accessible to all personnel who carry out or intend to carry out work 	Project Manager
	Planning	<p>This Asbestos Register will record:</p> <ul style="list-style-type: none"> identified friable asbestos in the workplace the date the friable asbestos was identified the location of the friable asbestos <p>Only workers holding an unrestricted asbestos licence may carry out asbestos removal.</p> <ul style="list-style-type: none"> Unrestricted: Allows people to remove all forms of asbestos (friable and non-friable) and replaces the current asbestos removal licence. 	
	Training and inductions	<p>As part of the Site Induction, workers will be informed of the Site specific controls required for management asbestos in soil:</p> <ul style="list-style-type: none"> Site access restrictions Correct use of PPE Decontamination procedures Use of monitoring equipment Waste handling procedures <p>Dust control measures and performance measures</p>	HSE Advisor
	Access Restrictions	<ul style="list-style-type: none"> Signs and barriers will be erected to warn of the danger and to prevent unauthorised people entering areas where friable asbestos contaminated fill material is being excavated/ handled. 	Project Manager

Construction Management Plan Western Paddock Remediation

Georgiou

Appendix 3b - Friable Asbestos Management Sub Plan		Responsibility
	<ul style="list-style-type: none"> The location and extent of any access control areas will be agreed in discussion between the Project Manager, Project Engineer, HSE Advisor and the Environmental Coordinator and will be established in accordance with NOHSC:2002 (2005) Code of Practice for the Safe Removal of Asbestos (2nd Ed.) guidelines. Potential entry points to the friable asbestos work area should be signposted or labelled in accordance with AS 1319 (1994) Safety Signs for the Occupational Environment and NOHSC: 2002 (2005b). 	
Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> Only personnel with appropriate personal protective equipment (PPE) and training will be allowed to work inside the friable asbestos work area. In addition to hard hats, safety boots, safety glasses and hearing protection, the minimum protective equipment worn for personnel will be disposable overalls, gloves and a powered air-purifying respirator. The filter type within the respirator should be Class P2, as stipulated in the Code of Practice for the Safe Removal of Asbestos (NOHSC, 2005). Heavy vehicle and excavation equipment will be fitted with air-conditioned cabins with HEPA filters to mitigate dust exposure of operators. Where this is not possible, operators will be required to wear PPE as specified above. 	Project Manager
Decontamination	<ul style="list-style-type: none"> All contaminated materials, including cleaning rags, plastic sheeting and PPE etc, must be disposed of as asbestos waste (NOHSC, 2005). The following procedures (based on Code of Practice for the Safe Removal of Asbestos (NOHSC, 2005)) will be implemented: Tools and Equipment <ul style="list-style-type: none"> At the end of removal work, all tools should be decontaminated in the following manner: decontaminated using wet or dry decontamination methods as outlined in the NOHSC (2005a) Code of Practice for the Safe Removal of Asbestos i.e. fully dismantled and cleaned under controlled conditions; or placed in sealed containers (and used only for asbestos removal work); or disposed of as asbestos waste. If tools cannot be decontaminated within the asbestos work area, or are to be re-used on another project, they should be tagged to indicate possible contamination and double bagged in asbestos waste bags before being removed from the asbestos work area. Personal Decontamination <ul style="list-style-type: none"> Personal decontamination must be undertaken each time employees leave the asbestos work area 	Project Manager

Construction Management Plan Western Paddock Remediation

Georgiou

Appendix 3b - Friable Asbestos Management Sub Plan		Responsibility
	<p>(NOHSC, 2005). This should occur within the asbestos work area so as to not transport material off-site, but should be located within an area where re-contamination is minimised.</p> <ul style="list-style-type: none"> - Throughout the asbestos removal process, asbestos contaminated PPE should not be transported outside the asbestos work area except for disposal purposes. - Before work clothes and footwear worn during asbestos work are removed from the work area, they should be thoroughly vacuumed with an asbestos vacuum cleaner to remove any asbestos fibres, and footwear should be wet wiped. <ul style="list-style-type: none"> ▪ Personal respiratory protective equipment should continue to be worn until all contaminated disposable coveralls and clothing has been removed and bagged for disposal; and personal washing completed. ▪ Vehicles exiting the project area via a wheel wash to ensure the vehicle is clean ▪ No excess spoil transferred into the coppershop road area where periodic sweepers may be employed if required 	
Waste Management	<ul style="list-style-type: none"> ▪ Any waste bags, skips, or vehicle trays used to store and/or transport potentially asbestos containing material (i.e. disposable PPE) will be appropriately labelled advising handlers of the nature of the contents. Transport of asbestos must be undertaken in accordance with the Environmental Protection (Controlled Waste) Regulations 2004. ▪ All soils and waste, which cannot be accommodated onsite, will be disposed of by a licenced sub-contractor at an appropriately licenced landfill with requirements of the Waste Management Sub Plan and Materials Tracking System implemented (see Appendix 2). 	Project Manager
Dust Control	<p>Dust control measures are required to conform to DER guidelines (DEC, 2011) which include the following measures:</p> <ul style="list-style-type: none"> ▪ Movement of excavated soil will be minimised to prevent dust generation and maintained under damp conditions. ▪ Earthworks will be undertaken in stages to avoid the creation of large areas of disturbance, which represent a source of dust emissions. ▪ Water carts will be available. ▪ Watering will be conducted using water trucks and impulse sprinklers may also be considered as required. Watering will be conducted at the following areas: <ul style="list-style-type: none"> - Sites undergoing excavations. - In areas being excavated / remediated, the application of water will be controlled to prevent ponding or run-off occurring. 	Project Manager

Construction Management Plan Western Paddock Remediation

Georgiou

Appendix 3b - Friable Asbestos Management Sub Plan		Responsibility
	<ul style="list-style-type: none"> - Uncovered, short-term stockpiles. - On all internal access tracks and machinery storage areas. - Regular maintenance checks of dust suppression equipment will be conducted to ensure effective operation. ▪ Internal access tracks will be hard surfaced and appropriate speed limits will be imposed to reduce dust generation. ▪ Internal tracks will be wetted down to minimise dust generation in transport areas. Water will be applied to the access tracks in the morning prior to each day or activity. Additional water will be applied to the tracks throughout the day, as required. 	
Contingency Response	Please refer to appendix 13a for contingency measures	Project Manager
Stockpile Contingency Measures	<p>Friable asbestos impacted waste will be excavated, Stockpiled on plastic, tested and then placed into trucks and removed from the Site.</p> <ul style="list-style-type: none"> ▪ In order to reduce potential impacts of stockpiles on surface water quality, all stockpiles will be placed at least 30m from surface water. ▪ All stockpiles will be plastic lined to contain soil or surface run-off. ▪ Any temporary stockpiles of asbestos contaminated soil will be maintained under moist conditions. ▪ Stockpiled material will be disposed of off-site in accordance with the Landfill Waste Classification and Waste Definitions 1996 (as amended 2009) (DEC, 2009). ▪ In order to confirm that all contaminated soil has been removed, validation sampling beneath 'small' stockpiles (<20m³) will comprise one composite sample analysed for asbestos. Validation sampling beneath stockpiles of greater volume will be dictated by the footprint area of the stockpile and sampled in accordance with DER guidelines using systematic grid sampling strategy for asbestos. ▪ Validation samples from beneath stockpiles will be analysed for asbestos and compared against the nominated validation criteria. 	Project Manager
Air Monitoring	<ul style="list-style-type: none"> - The applicable standards for monitoring asbestos are provided in Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres (NOHSC, 2005b), the Code of Practice for the Safe Removal of Asbestos (NOHSC, 2005a) and the Occupational Safety and Health Regulations 1996. The National Exposure Standard (NES) as established by the Australian Safety and Compensation Council (ASCC, formerly the NOHSC) is 0.01 fibres/mL of air measured using the membrane filter method for all forms of asbestos. 	Project Manager

Construction Management Plan Western Paddock Remediation



Appendix 3b - Friable Asbestos Management Sub Plan				Responsibility
		<div> <div><0.01</div> <div>0.01</div> </div> <ul style="list-style-type: none"> If for any reason static samples / personal monitoring samples fail to reach the laboratory in time, then samples will be analysed on a 48hr/two working day turnaround. The reason for failure to deliver the samples on the day will be required to be reported within 24hrs of becoming aware of the event. <p>Once all subsurface excavation works have been completed, sampling for fugitive asbestos fibres will cease.</p>		
Environmental Inspections & Monitoring	Daily (Documented)	<ul style="list-style-type: none"> Monitoring Carried out by the Environmental Consultant 		Project Manager
	Weekly (Documented)	<ul style="list-style-type: none"> Monitoring Carried out by the Environmental Consultant 		Project Manager
	Monthly (Documented)	<ul style="list-style-type: none"> DHI Environmental Inspection Carried out via OneApp 		Project Manager
Reporting	HSEQ Monthly Management Meeting			Project Manager

Construction Management Plan Western Paddock Remediation



Appendix - 4'

Construction Management Plan

Western Paddock Remediation

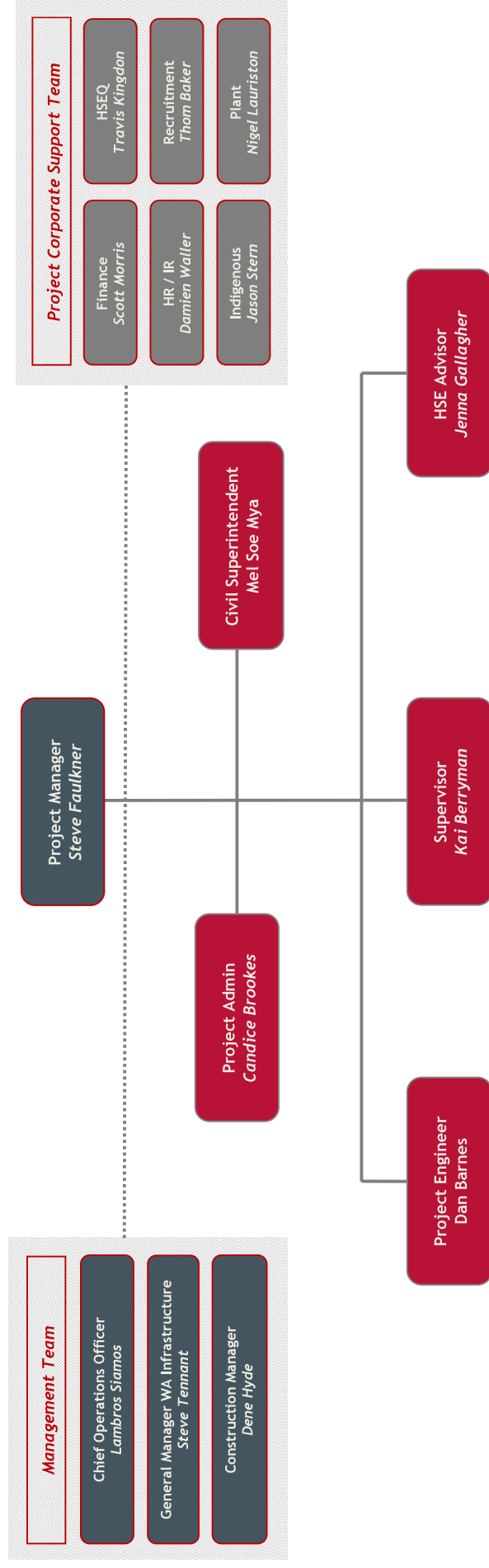


MRA

WESTERN PADDOCK

WESTERN PADDOCK

PROJECT ORGANISATION CHART



Construction Management Plan Western Paddock Remediation



Appendix 5

**Midland Western Paddock Remediation – Construction
Methodology**

CONTRACT 237550-00

Construction
Method Statement
(QA-MS-001)

June 2015 (Rev 0)

Construction Management Plan

Western Paddock Remediation



APPROVAL & AUTHORIZATIONS

Method Statement – Midland Western Paddock – Construction Method					
Document No:	QA-MS-001	Revision:	0	Date:	10/06/2015
Description:	Earthworks				
Author (Georgiou):	Print Thomas Flynn	Sign:	Date:		09/6/15
Reviewed and Approved (Georgiou):	Print:	Sign:	Date:		
Reviewed and Approved (Georgiou):	Print:	Sign:	Date:		

Approval of the construction Method Statement and any additional control Procedures listed therein where applicable must be completed prior to work commencing.

Midland Western Paddock Remediation

**CONSTRUCTION
METHODOLOGY STATEMENT**

TABLE OF CONTENTS

1.0	Preliminaries
1.1	Introduction & Objective
1.2	Scope of Work
1.3	Relevant Documents
2.0	Pre-Construction Requirements
2.1	Safety & Environmental (Pre-Construction)
2.2	Plant & Equipment
2.3	Personal Protective Equipment
2.4	Quality & Approval Requirements (Pre-Construction)
3.0	11
	Construction Sequence
3.1	Construction Methodology – Construction Area
4.0	Plant and Equipment Weight/Load ON Underground 132KVA crossing

Location of Site



[illegible]

Construction Staging Plan – Stockpiles For Classification Testing



Method Statement

1.0 Preliminaries

1.1 Introduction & Objective

The objective of the Western Paddock Remediation methodology is to detail and specify the procedures, processes and methods to be employed for the construction of the Stockpile remediation, as part of Western paddock Remediation Works.

1.2 Scope of Work

The project will consist of bulk earthworks, re-profiling of pre-classified contaminated material onsite and importation of clean fill to form a capping layer. Locating and if applicable Protection of existing services, reinstatement of existing ground conditions and storm water run-off management during works.

1.3 Relevant Documents

- Georgiou Workplace Inspection Checklist
- Georgiou Procedure for locating services
- Georgiou Risk Assessment and HSE Management Plan
- Georgiou Procedure for working in vicinity of existing services
- Aurora Environmental Management Plan
- Statutory regulations for working near existing services
- Ministerial Statement 612

1.4 Definitions

- Stakeholders – Adjacent Property Owners
- Aurora – Environmental Consultant
- MRA – Metropolitan Redevelopment Authority
- Superintendent - Arup
- Contractor - Georgiou
- Ministerial Statement 612 – Approval by the minister for Environment
- Service Providers – Telstra/Western Power/Atco Gas

2.0 Pre-Construction Requirements

2.1 Safety & Environmental (Pre-Construction)

Item	Hazards	Control
1.	Approval to commence from MRA/Superintendent/Service Providers	<ul style="list-style-type: none"> - Approval from Western Power to work within the vicinity the corridor must be granted prior to works commencing in this area - A methodology must be agreed with the Superintendent/MRA prior to commencing works and this must be submitted and approved. (This Document) - A risk assessment must be carried out prior to Work commencing including Emergency procedures and notifications required by Service providers. - Dedicated channel UHF (tbc) for plant and machinery in the construction area and on haul roads; - Daily Pre-Start meetings; - Traffic Management plans in place, with adequate signage requirements adhered to; - Spotters to be used where applicable; - Pre-plan load & haul, place and compact activities. - Commencement of works and existing Service protection must be approved by Suppliers and Superintendent - Supervisor and or Dozer/Grader/Excavator operator to conduct a pre work inspection of work area and Plant
2.	Material transport & delivery	<ul style="list-style-type: none"> - Traffic Management Plan & Traffic Control Diagrams; - Planning & pre-determined haul roads
3.	Dust/Environmental Control	<ul style="list-style-type: none"> - Use of water-carts as required on haul roads and access roads; - Reduce speed of heavy vehicles & light vehicles as required; - Drive-to conditions. - Aurora Environmental Management plan - Wheel Wash at Site Entrance - Limit Areas of cut to fill activities and stockpiles - Dust Monitors
4.	Power lines/gas line and other obstructive areas	<ul style="list-style-type: none"> - Working within the vicinity of overhead power lines risk assessment - Identify underground and overhead services - Identify if there is a need to work in the vicinity of power lines adjacent to work area; - In the event where it is necessary to be working within the vicinity of power lines the Georgiou Procedure for working within the vicinity of powerlines and the power companies policy/Worksafe policy for working near overhead powerlines will be followed. Permits will be approved prior - Flag/ highlight boundary near the unauthorized areas - Traffic Management Plan & Traffic Control Diagrams;

5.	Any Hazards that are identified during works that cannot be immediately or safely controlled with present resources	<ul style="list-style-type: none">- Any worker on the job has the right to stop a job if he/she feels that it is unsafe.- If a worker feels there is an immediate threat to safety of himself, other workers, plant or the environment there is an obligation of the worker to stop the job by any safe and effective means and report it to the supervisor.- If there is a deviation in the scope of works outline in the JHA/JSEA anyone may stop the job.- This gives any worker the power to stop the job, inform work colleagues about the hazard that has presented its self and discuss how they are going control the hazard. Only when sufficient, effective and approved controls put in place and the JHA AMENDED and signed, work may resume.
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2.2 Plant & Equipment

Item	Primary Plant	Tasks
1.	Swampy Dozer D6	<ul style="list-style-type: none"> - Stripping /Clearing - Cut to Fill – pushing Material - Creating windrows/V-Drains for storm water Control – Temporary, - Import fill – pushing 300mm capping layer Fill over Geofabric
2.	Moxy's (Ejectors)	<ul style="list-style-type: none"> - Hauling of Stripped vegetation and Cut material (Ejector body to be used not Vertical tipped body to act as a control near overhead power)
3.	Wheel Loader	<ul style="list-style-type: none"> - Haul Road maintenance - Placement of material - Clearing - Geofabric Placement
4.	Excavator	<ul style="list-style-type: none"> - Excavate Temporary Storm water Drains - Trim Batters - Place Plates if required - Strip vegetation - Load Dump trucks
5.	Water Cart	<ul style="list-style-type: none"> - Dust Suppression
6.	Exc 5T	<ul style="list-style-type: none"> - Geofabric Placement
7	Roller	<ul style="list-style-type: none"> - Compact Fill

2.3 Personal Protective Equipment

Item	PPE	Usage Requirement
1.	Hard-hats	Mandatory
2.	Safety-Glasses	Mandatory
3.	Hi-Vis Clothing	Mandatory
4.	Safety Boots	Mandatory
5.	Gloves	Mandatory
6.	Mono-goggles	As-required.
7.	Ear Plugs	As-required.
8.	Take 5's	Mandatory
9.	Dust Masks	As-required

- If material classified as Hazardous controls as per the HSEMP will be Mandatory.

2.4 Quality & Approval Requirements (Pre-Construction)

Item	Task	Description
1.	Approval from Client / Superintendent/ Contractor	<ul style="list-style-type: none"> - Ground Disturbance Permits - Clearing Permits - Excavation Permits - Hot Work Permit - Approved Method Statement (this document) - Approval to commence works – Service Providers
2.	Survey Setouts & Requirements	<ul style="list-style-type: none"> - Site Boundary - Set out approximate location of each service from As-constructed data/DBYD - As-constructed pick-ups
3.	Scope of Work	<ul style="list-style-type: none"> - Work carried undertaken as per scope (section 1.2 above)
4.	Daily Pre-Starts & Checks	<ul style="list-style-type: none"> - Review & sign-on task specific JHA's - Daily pre-start inspections using the Georgiou machir specific pre-start inspection checklist books. -WORK AREA supervisor inspections using the <i>Georgiou Supervisors Daily Inspection Checklist</i>.
5.	Environmental / Rehabilitation	<ul style="list-style-type: none"> - Approved Health safety & Environmental Management Plan - Approved Construction Method Plan

3.0

Construction Sequence

3.1 Construction Methodology – Construction Area

Item	Task	Description
1.	Service locating & Protection 132KVA Western Power	<ul style="list-style-type: none"> - Prior to any construction activities all services that are known and shown on DBYD will be located and verified. - Protect underground Service with approved method from Western Power Engineer for Loading as per Table SECTION 4.0 below. Dozer, Grader or Wheel loader (whichever is approved by Service provider due to load restrictions) to clear the permit boundaries with Arup representative/ Western Power representative present - The Depth/height of the fill over the power easement will be as per the Service providers recommendation - The weight of the Plant equipment traversing the corridor is outlined in a table below. The fill be deepest across the corridor and will start to taper off from the edge of the corridor at 1:2 slope.
2.	Clearing & Grubbing Stage 1	<ul style="list-style-type: none"> - Approved Clearing Permits/disturbance permits to be issued by Arup/Aurora/Council before any clearing takes place - Survey set out of clearing boundaries - Dozer, Excavator or Wheel loader (whichever is approved by Service provider due to load restrictions) to commence clearing of stage 1 area. Refer to Construction Staging Plan page 1 above. - Cleared material is to be stockpiled on top of stage 2 on a pre placed plastic liner. - The material can be tested in stockpile location on top of stage 2 for classification purposes. - A temporary haul track will be constructed with imported fill (Limestone) in the location where the permanent Access track (4.0m wide) will be constructed at 1:8 vertical slope - The material will then be loaded onto Road trucks on top of the stockpile and carted off site to the pre-determined tip depending upon classification. - Water Cart will be used full time to keep the ground moist to prevent dust rising.

3.	Stripping & Stockpiling of Topsoil	<ul style="list-style-type: none"> - Wheel loader/Excavator/Dozer to strip topsoil to a depth as directed by the Superintendent, and stockpile on stage 2 on a pre placed plastic line - The material can be tested in stockpile location on top of stage 2 for classification purposes. - Water Cart will be used full time to keep the ground/stockpile moist to prevent dust rising. - The material will then be loaded onto Road trucks and carted off site to the pre-determined tip depending upon classification.
4.	Cut to Fill Activities	<ul style="list-style-type: none"> - Dozer/Excavator to construct water runoff management drains (channel drain) around the perimeter of the stage 1 Earthworks at the toe of the stockpile away from the edge of the clearing. This will then be pumped using a 2" pump if required and lay flat into A small bund ed area that will be constructed as a holding pond will be where the storm water is being pumped into and this will slowly dissipate/infiltrate into the existin Ground. - The Dozer/Excavator shall then push the cut material locally across to the nearest fill section to minimize dust impact ensuring a fall grade from the edges are maintained to allow for water run-off and direct it towards the channel drains. - Water Cart will be used full time to keep the ground/stockpile moist to prevent dust rising. - A roller will be used with to compact the material. - When compacting the fill at an elevation greater than 1.5m – spotter must be used while rolling within 0.5m of edge of the embankment - Rollers must not reverse roll within 0.5m of the edge of the embankment fill if over 1.5m - Positive communication must be received between all plant and personnel prior to passing on the fill area - Plant & personnel to only enter the work area after signing on the JHA after reading and understanding the procedure and Notifying the Dozer/Excavator operator & other plant working in the area - A spotter where required must be used as per Georgiou procedures

5.	Placing Geofabric	<ul style="list-style-type: none"> - Approved Geofabric will be placed on the finished cut to fill surface once the smooth drum roller has finished compaction. - A wheel loader or 5t Excavator will lift the Geofabric roll with a specialized lifting attachment to suit the roll. - The roll will be placed 1m out from the toe of the stockpile and pulled up the batter using the excavator/Loader and then placed out on top of the stockpile and held into place using fill placed at intervals on top of the geofabric. - The Geofabric rolls when placed will overlap each other by a minimum of 300mm to ensure integrity and continuity.
6.	Import Fill	<ul style="list-style-type: none"> - The trucks must only dump the material as far back as the backwheels of the truck are on the existing ground that has fill material already. – They must not drive on the Geofabric and must only dump under instruction from the Dozer operator. - The Dozer Will push the import fill from stockpile forward over the Geofabric and track over the pushed out material each time. At no time will any piece of plant track/drive over the geofabric unless clean import fill has been placed on it prior. - If a supervisor has to change the dumping arrangement then he/she must instruct the Dozer/Excavator operator to cease operations review the JHA make necessary changes and implement the new work procedure - The Supervisor will then in turn instruct the Moxy/Truck operators of the change and the new plan will thus be communicated and confirmed by all - Positive two-way radio communication must be kept at all times between the Moxy's/Trucks and Dozer/Grader operator - Again The Grader/Dozer shall then push the material across the span of the Crossing ensuring a cross fall grade from the edges are maintained to allow for water run off

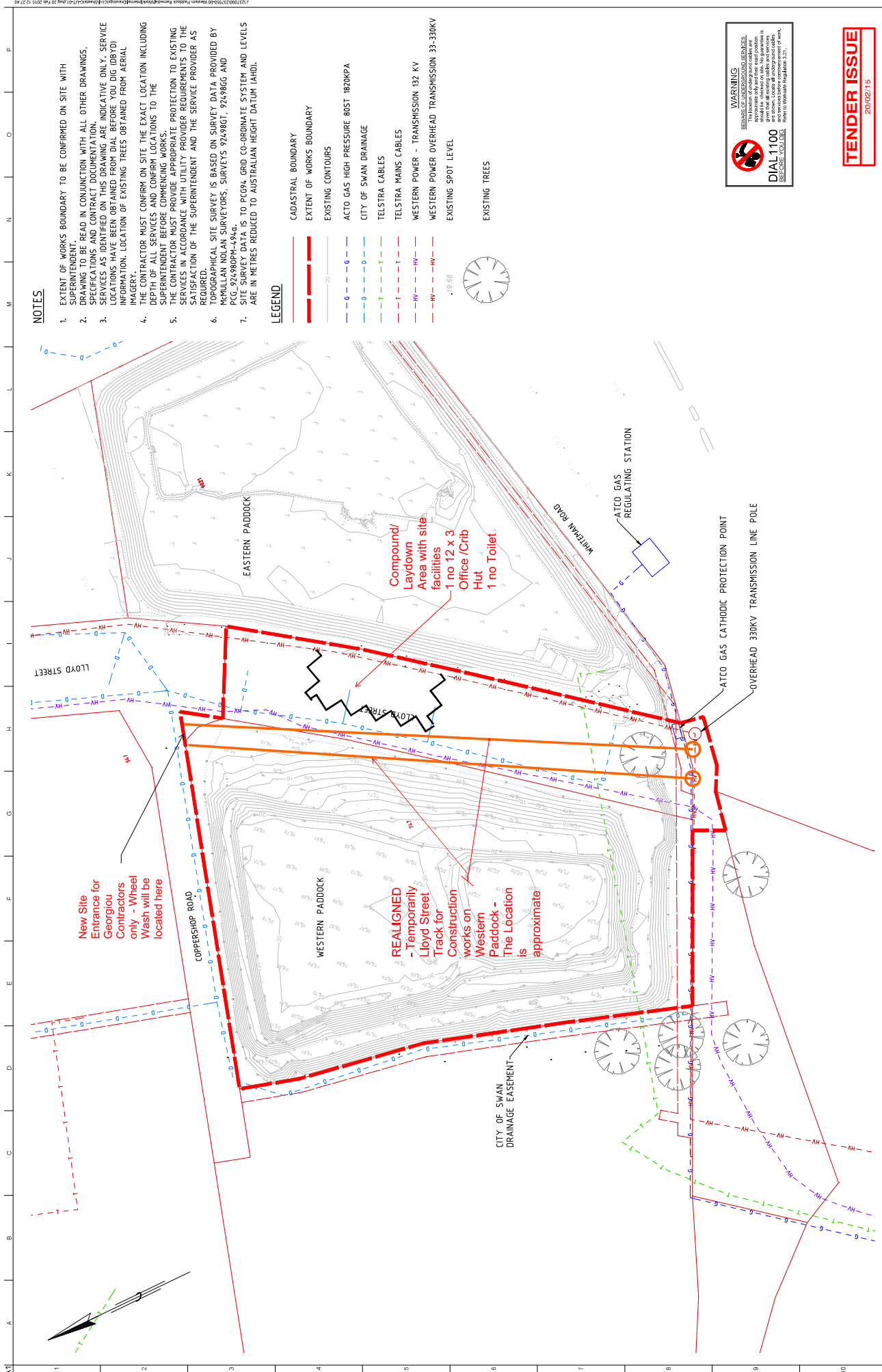
7.	Clearing & Grubbing Stage 2	<ul style="list-style-type: none"> - Once the cut to fill activities have been completed in stage 1 the Dozer, Excavator or Wheel loader will commence clearing of stage 2 area. Refer to Construction Staging Plan page 1 above. - Cleared material is to be loaded onto the Moxy dump trucks and stockpiled in the designated area on ground level for testing. - The material can be tested in stockpile location for classification purposes. - The material will then be loaded onto Road trucks and carted off site to the pre-determined tip depending upon classification. - Water Cart will be used full time to keep the ground/stockpile moist to prevent dust rising. -
8	Stripping & Stockpiling of Topsoil	<ul style="list-style-type: none"> - Wheel loader/Excavator/Dozer to strip topsoil to a depth as directed by the Superintendent, and loaded onto the Moxy dump trucks and stockpiled in the designated area on ground level for testing. - The material will then be loaded onto Road trucks and carted off site to the pre-determined tip depending upon classification.

9.	Cut to Fill Activities	<ul style="list-style-type: none"> - Dozer/Excavator to construct water runoff management drains (channel drain) around the perimeter of the stage 1 Earthworks at the toe of the stockpile away from the edge of the clearing. This will then be pumped using a 2" pump if required and lay flat into a small bund ed area that will be constructed as a holding pond where the storm water will slowly dissipate/infiltrate into the existing Ground. - The Dozer/Excavator shall then push the cut material locally across to the nearest fill section to minimize dust impact ensuring a fall grade from the edges are maintained to allow for water run-off and direct it towards the channel drains. - Water Cart will be used full time to keep the ground/stockpile moist to prevent dust rising. - A roller will be used with to compact the material. - When compacting the fill at an elevation greater than 1.5m – spotter must be used while rolling within 0.5m of edge of the embankment - Rollers must not reverse roll within 0.5m of the edge of the embankment fill if over 1.5m - Positive communication must be received between all plant and personnel prior to passing on the fill area - Plant & personnel to only enter the work area after signing on the JHA after reading and understanding the procedure and Notifying the Dozer/Excavator operator & other plant working in the area - A spotter where required must be used as per Georgiou procedures -
10.	Placing Geofabric	<ul style="list-style-type: none"> - Approved Geofabric will be placed on the finished cut to fill surface once the smooth drum roller has finished compaction. - A wheel loader or 5t Excavator will lift the Geofabric roll with a specialized lifting attachment to suit the roll. - The roll will be placed 1m out from the toe of the stockpile and pulled up the batter using the excavator/Loader and then placed out on top of the stockpile and held into place using fill placed at intervals on top of the geofabric. - The Geofabric rolls when placed will overlap each other by a minimum of 300mm to ensure integrity and continuity.

11.	Import Fill	<ul style="list-style-type: none"> - The trucks must only dump the material as far back as the backwheels of the truck are on the existing ground that has fill material already. – They must not drive on the Geofabric and must only dump under instruction from the Dozer operator. - The Dozer Will push the import fill from stockpile forward over the Geofabric and track over the pushed out material each time. At no time will any piece of plant track/drive over the geofabric unless clean import fill has been placed on it prior. - If a supervisor has to change the dumping arrangement then he/she must instruct the Dozer/Grader operator to cease operations – review the JHA make necessary changes and implement the new work procedure - The Supervisor will then in turn instruct the Moxy/Truck operators of the change and the new plan will thus be communicated and confirmed by all - Positive two-way radio communication must be kept at all times between the Moxy's/Trucks and Dozer/Grader operator - Again The Grader/Dozer shall then push the material across the span of the Crossing ensuring a cross fall grade from the edges are maintained to allow for water run off - Water Cart will be used full time to keep the ground/stockpile moist to prevent dust rising. - Water Cart will be used full time to keep the ground/stockpile moist to prevent dust rising. - A roller will be used with to compact the material. - When compacting the fill at an elevation greater than 1.5m – spotter must be used while rolling within 0.5m of edge of the embankment - Rollers must not reverse roll within 0.5m of the edge of the embankment fill if over 1.5m - Positive communication must be received between all plant and personnel prior to passing on the fill area - Excavator and or Swampy will final trim levels to side slopes and top and roller will finish off with a non-vibratory roll and the watercart will Spray water to moisten the fill to ensure cohesion to prevent dust blowing while waiting on Hydro mulching.
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4.0 Plant and Equipment Weight/Load ON Underground 132KVA crossing

Item	Primary Plant	Weight crossing Gasline Corridor
1.	Dozers D 6	- 18 Tonne Operating weight
2.	Moxy/Articulated Truck D40	<ul style="list-style-type: none"> - Front Axle Loaded - 21.48t - Centre Axle loaded – 26.15t - Rear Axle Loaded – 25.91t
4.	Excavator	- 22 - 47T Operating weight
5.	Water Cart 740	- 46T unloaded
7	Roller 18t	<ul style="list-style-type: none"> - Operating Weight with Cab - 17.2t - Weight at Drum with Cab 10.9t - Vibratory System Centrifugal Force: - 166Kn Min - 322Kn Max
8	Wheel Loader 972	- Operating Weight - 26t
9	Road Tipper Trucks	<ul style="list-style-type: none"> - Single Steer Axle 6t - Tandem drive Axle 17t - Quad axle Group 27t - Semi-Truck Total Loaded capacity 50t



NOTES

1. EXTENT OF WORKS BOUNDARY TO BE CONFIRMED ON SITE WITH SUPERINTENDENT.
2. DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS, SPECIFICATIONS, CONTRACT DOCUMENTATION, AND ANY ADDITIONAL INFORMATION PROVIDED BY THE SUPERINTENDENT.
3. LOCATIONS HAVE BEEN OBTAINED FROM DIA BEFORE YOU DIG (BYD) INFORMATION. LOCATION OF EXISTING TREES OBTAINED FROM AERIAL IMAGERY.
4. THE CONTRACTOR MUST CONFIRM ON SITE THE EXACT LOCATION INCLUDING DEPTH OF ALL SERVICES AND CONFIRM LOCATIONS TO THE SUPERINTENDENT BEFORE COMMENCING WORKS.
5. THE CONTRACTOR MUST PROVIDE APPROPRIATE PROTECTION TO EXISTING SERVICES IN ACCORDANCE WITH UTILITY PROVIDER REQUIREMENTS TO THE SATISFACTION OF THE SUPERINTENDENT AND THE SERVICE PROVIDER AS REQUIRED.
6. TOPOGRAHICAL SITE SURVEY IS BASED ON SURVEY DATA PROVIDED BY MURDOCH NOLAN SURVEYORS. SURVEYS 92496T, 92498G AND PCG 92498PM-194a.
7. SITE SURVEY DATA IS TO PG94 GRID CO-ORDINATE SYSTEM AND LEVELS ARE IN METRES REDUCED TO AUSTRALIAN HEIGHT DATUM (AHD).

LEGEND

- CADASTRAL BOUNDARY
- EXTENT OF WORKS BOUNDARY
- EXISTING CONTOURS
- ACTO GAS HIGH PRESSURE 80ST 1820KPA
- CITY OF SWAN DRAINAGE
- TELSTRA CABLES
- TELSTRA MAINS CABLES
- WESTERN POWER - TRANSMISSION 132 KV
- WESTERN POWER OVERHEAD TRANSMISSION 33-330KV
- EXISTING SPOT LEVEL
- EXISTING TREES

WARNING
BEWARE OF UNDERGROUND SERVICES.
The Contractor must ensure that all services are accurately located and that the location is confirmed by the appropriate utility provider before any excavation work commences. The Contractor must ensure that all services are accurately located and that the location is confirmed by the appropriate utility provider before any excavation work commences. The Contractor must ensure that all services are accurately located and that the location is confirmed by the appropriate utility provider before any excavation work commences.

DIAL 1100
BEFORE YOU DIG

TENDER ISSUE
20/02/15

Client

Item	Qty	Unit	Price	Total
A	2002/15	NF	L14	MP

Based For Tender

Item	Qty	Unit	Price	Total
A	2002/15	NF	L14	MP

Job Title

Western Paddock

Scale 1:1 T 1:50

Drawn By

Checked

Drawing Title

Site Survey & Existing Services

Drawing Status

For Tender

20/02/15

237550-00

C-U1-41

Sheet

A

ARUP

605 Wellington Street, West Perth, Australia
Tel: +61 (0) 89 481 1334
Fax: +61 (0) 89 481 1334
www.arup.com

MRA Metropolitan Redevelopment Authority

20/02/15

APPENDIX 8

Atmospheric Monitoring Locations

Atmospheric Monitoring Locations



Asbestos and PM₁₀ Monitoring Location




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