

# Jandakot Airport

## Local water management strategy

Prepared for Jandakot Airport Holdings

By Essential Environmental

July 2015



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## 1 INTRODUCTION

Jandakot Airport is leased from the Commonwealth Government by Jandakot Airport Holdings (JAH) and is an important piece of state infrastructure, being Western Australia's major general aviation airport.

### 1.1 Legislative background

Jandakot Airport is Commonwealth Land and is therefore subjected to Commonwealth legislation (Primarily the *Airports Act 1996*, *Airports (Environment Protection) Regulations 1997* and the *Environment Protection and Biodiversity Conservation Act 1999*). State legislation may apply where Commonwealth Legislation is silent or does not conflict.

#### 1.1.1 Commonwealth Legislation

##### **Airports Act 1996**

The Airports Act 1996 requires the operator of an airport to prepare an Airport Master Plan and Environment Strategy every five years. This GMP complements the Jandakot Airport Master Plan 2009, the Jandakot Airport Environment Strategy 2009 (JAH 2009b), and the recently approved Jandakot Airport Master Plan 2014 (which under changes to the Airports Act 1996 incorporates the Environment Strategy).

##### **Airports (Environment Protection) Regulations 1997**

The *Airports (Environment Protection) Regulations 1997* requires the development and adoption of a comprehensive environmental management system (EMS). Environmental management at the Airport is the responsibility of Jandakot Airport Holdings. The Jandakot Airport EMS comprises policies and procedures that ensure the protection of the environment within the airport, including preparation of management plans, incident reporting systems, awareness training, auditing, monitoring and reporting within a context of continuous improvement.

##### **Environment Protection and Biodiversity Conservation Act 1999**

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for the protection of the environment, especially matters of national environmental significance (NES). Under the EPBC Act, a person must not take action that has, will have, or is likely to have a significant impact on any matters of NES without approval from the Australian Government Environment Minister.

The initial *Jandakot Airport Local Water Management Strategy* (LWMS) and *Groundwater Management Plan* (GMP) were developed to support the expansion of development of Jandakot Airport into Precinct 5, which is located within the Priority 1 Source Protection Area of the JUWPCA. The requirement for the LWMS and GMP was (and remains) directly associated with EPBC 2009/4796 conditions of approval, specifically Condition 7 which states:

*"The person taking the action must develop and submit a Jandakot Groundwater Mound Management Plan which must include but not be limited to:*

- a. Groundwater monitoring and reporting;
- b. Provision of groundwater monitoring reports to the Western Australian Department of Water and Water Corporation;

- c. Address all relevant measures included in the **Local Water Management Strategy**;
- d. Schedules for the independent audit of groundwater monitoring results and reports;
- e. Spill avoidance, management and rehabilitation measures and procedures;
- f. The introduction of a sewerage system;

*The Jandakot Groundwater Mound Management Plan must be submitted within four (4) months of the date of this approval.*

**Construction** must not commence within precinct 5 until the Jandakot Groundwater Mound Management Plan has been approved by the **Minister**. The approved Jandakot Groundwater Mound Management Plan must be implemented."

In 2014, the Department of the Environment approved EPBC 2013/7032, which allows for the clearing and development of Precinct 6, which is also partially within the Priority 1 Source Protection Area of the JUWPCA. Condition 2 of EPBC 2013/7032 states:

2. *To mitigate impacts to the environment from an action on Commonwealth land, in particular the Jandakot Groundwater Mound, the person taking the action must prepare and submit a revised Groundwater Management Plan to the Minister for approval. The revised plan must be submitted at least 3 months prior to commencement of the action.*

*The revised plan must include, but not be limited to:*

- a. The introduction of a sewerage system;
- b. Provision of groundwater monitoring reports to the Western Australian Department of Water and Water Corporation;
- c. A water management strategy, specifically designed for Precincts 6 and 6A;
- d. Schedule for the independent audit of groundwater monitoring results and reports
- e. Spill avoidance, management and rehabilitation measures and procedures
- f. Groundwater monitoring; and
- g. Acceptable development types.

*If the minister approves the revised plan the approved revised plan must be implemented.*

This Local Water Management Strategy has been prepared to provide updated information and strategies relevant to the Jandakot Airport estate with particular focus on the development of precincts 5, 6 and 6A.

### 1.1.2 State Legislation

Some State legislation can apply to Jandakot Airport under the provisions of the *Commonwealth Places (Application of Laws) Act 1970*. Regulation of environmental issues can therefore occur through state agencies in selected circumstances, typically in instances where Commonwealth legislation does not exist (ie waste management). Where State and Commonwealth legislation conflicts; Commonwealth legislation takes precedence.

Key water related State Government legislation that is relevant to the development of this LWMS are:

- State Planning Policy 2.9: Water Resources (2006)
- State Planning Policy 2.3: Jandakot Groundwater Protection (2003)
- Draft State Planning Policy 2.3: Jandakot Groundwater Protection (2014)

### State Planning Policy 2.9: Water Resources (SPP2.9)

State planning policies (SPP) are made under Section 26 of the *Planning and Development Act 2005*. They are the "highest" form of State Government policy and as such, Jandakot Airport Holdings should have 'due regard' to the provisions of the policies. *SPP No 2.9: Water Resources* (2006) contains 3 objectives. They are to:

- protect, conserve and enhance water resources that are identified as having significant economic, social, cultural and/or environmental values
- assist in ensuring the availability of suitable water resources to maintain essential requirements for human, and all other biological life, with attention to maintaining or improving the quality and quantity of water resources
- promote and assist in the management and sustainable use of water resources

SPP2.9 is supported by *Better Urban Water Management* (WAOPC, 2008) which provides guidance for the preparation of water management strategies and plans at each stage and scale of land use planning activity.

Although an Airport Master Plan is not specifically mentioned in *Better Urban Water Management* (WAPC, 2008), much of the planning activity is at the local level. Thus a local water management strategy has been prepared to support the Master Plan.

### State Planning Policy 2.3: Jandakot Groundwater Protection (SPP2.3)

*SPP No 2.3: Jandakot Groundwater Protection* (2003) contains 5 objectives. They are to:

- Ensure that all changes to land use within the policy area are compatible with the long-term protection and maintenance of groundwater for public water supply and maintenance of associated ecosystems
- Prevent land uses likely to result in contamination of groundwater through nutrient or contaminant export
- Balance environmental protection with the economic viability of the existing land uses
- Maintain or increase natural vegetation cover over the policy area.
- Protect groundwater quality and quantity in the policy area in order to maintain the ecological integrity of important wetlands hydraulically connected to that groundwater including wetlands outside the policy area.

The revised draft *SPP No 2.3: Jandakot Groundwater Protection* (2014) contains 4 objectives. They are to:

- Ensure that all changes to land use within the policy area are compatible with the long-term protection and maintenance of groundwater for public water supply and maintenance of associated ecosystems
- Protect groundwater quality and quantity in the policy area in order to maintain the ecological integrity of important wetlands hydraulically connected to that groundwater including wetlands outside the policy area.
- Prevent, minimise and manage in defined priority areas, land uses likely to result in contamination of groundwater.
- Maintain or increase natural vegetation cover over the policy area.

Priority areas for protection are defined under SPP2.3 as:

- Priority 1 areas – prevent risks
- Priority 2 areas – minimise risks
- Priority 3 areas – manage risks

The intent is to ensure that any land use within the policy area includes adequate protection against water quality contamination risks.

## 1.2 Scope of the strategy

Consistent with the requirements of Condition 2 of EPBC 2013/7032, *State Planning Policy 2.9: Water Resources* and *Better urban water management* (WAPC, 2008), this local water management strategy has been prepared to support the development of Precincts 6 and 6A (and ongoing development of Precinct 5) and to inform the preparation of a revised Groundwater Management Plan.

The following documents have been utilised to inform this plan's strategies and management principles:

- Perth-Peel regional water plan 2010-2013 (DoW, 2009)
- Jandakot Airport Local Water Management Strategy (VDM Consulting 2009)
- State Planning Policy 2.3: Jandakot Groundwater Protection (2003)
- Draft State Planning Policy 2.3: Jandakot Groundwater Protection (2014)
- Stormwater Management Manual for Western Australia (Department of Water, 2004-07)
- Australian Runoff Quality: A guide to water sensitive urban design (Engineers Australia, 2006)
- Jandakot Airport Master Plan 2014 (JAH 2014).

This LWMS has been prepared in accordance with the requirements of *Better Urban Water Management* (WAPC 2008) and the Department of Water's *Interim: Developing a local water management strategy* (2008). The LWMS aims to demonstrate to the satisfaction of relevant agencies:

- how the key principles and strategies of this plan have been addressed
- how the urban structure will address water use and management
- existing and required water management infrastructure
- detailed land requirements for water management

## 1.3 Implementation of the strategy

The principles and strategies contained within this LWMS should be implemented as part of land use planning and development and are consistent with the framework and requirements in *Better Urban Water Management* (WAPC 2008).

Table 5 summarises the roles and responsibilities relating to implementation of this LWMS.

## 1.4 The strategy area

Jandakot Airport is located approximately 18 km south of the Perth CBD, within the City of Cockburn. The land within Jandakot Airport that is the subject of this LWMS is delineated in Figure 1.

The subject land is currently zoned 'Public Purpose – Commonwealth Government' under the Metropolitan Region Scheme and has been identified as a 'Specialised Centre' in State Planning Policy 4.2 – Activity Centres for Perth and Peel. The land is similarly zoned 'Public Purpose – Commonwealth Government' under the City of Cockburn's Town Planning Scheme No 3 which also identifies the land within the 'Jandakot Airport Special Control Area'.

Part of the subject land lies within the Metropolitan Region Scheme Reserve for 'Water Catchments'.

The Jandakot Airport estate lies wholly within the boundary of the City of Cockburn. Part of the northern boundary of the estate (Leeming Road and Ken Hurst Park) abuts the southern boundary of the City of Melville, and the western boundary of the City of Canning abuts the north east airport boundary.

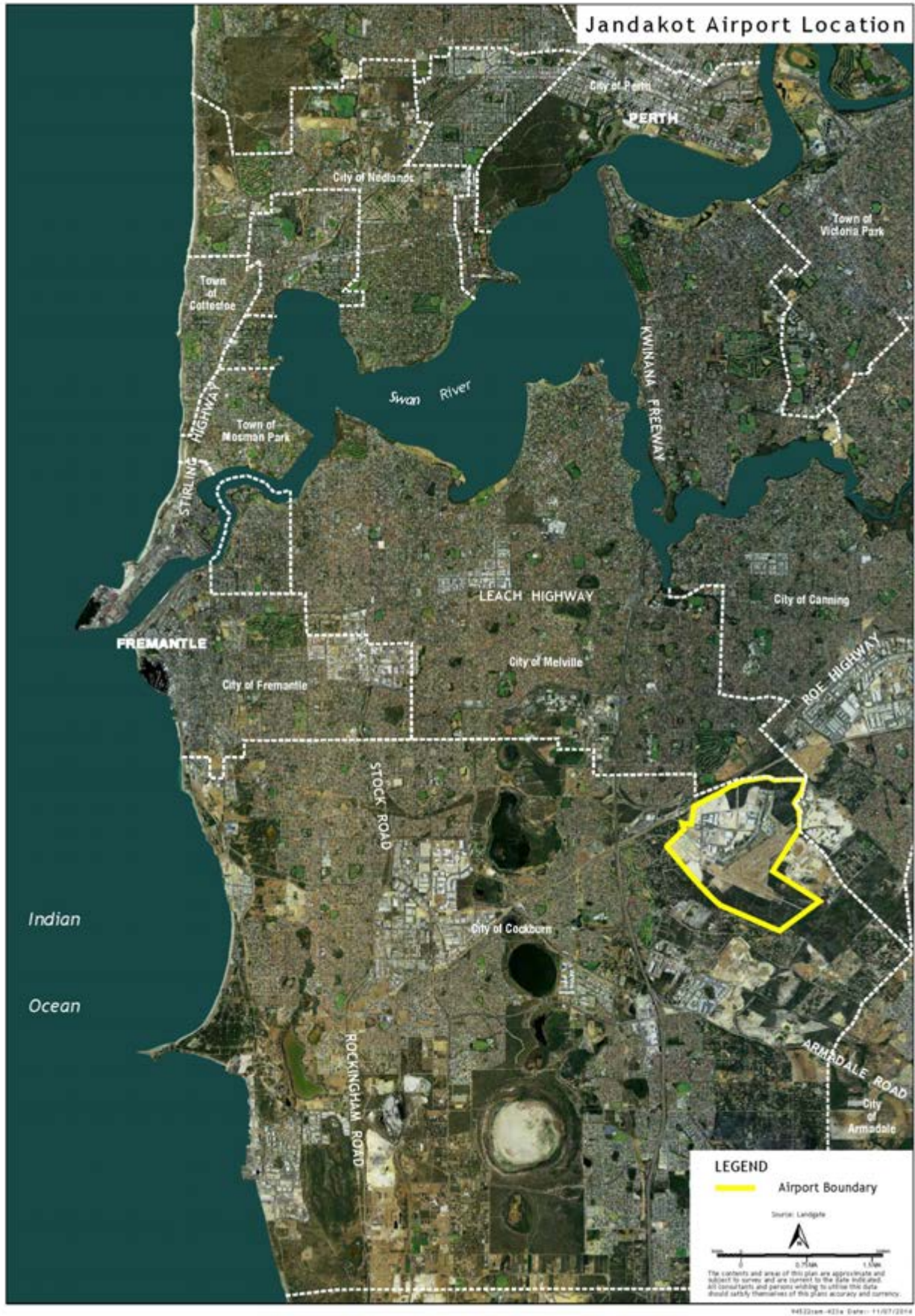


Figure 1: Location plan

## 2 CONTEXT

### 2.1 Environment

#### 2.1.1 Climate

A Mediterranean climate associated with hot dry summers and cool wet winters is a characteristic of the Perth region.

A Bureau of Meteorology weather station is located at Jandakot Airport and has been operating continuously since 1972. Rainfall has been recorded at the site since its establishment and temperature has been recorded since 1989.

The long term annual average rainfall recorded at Jandakot Airport is 823 mm. The year 1979 recorded the lowest rainfall on record at only 620.2 mm.

Temperatures recorded at Jandakot Airport range between 16 and 32 degrees in summer and between 6 and 18 degrees in winter.

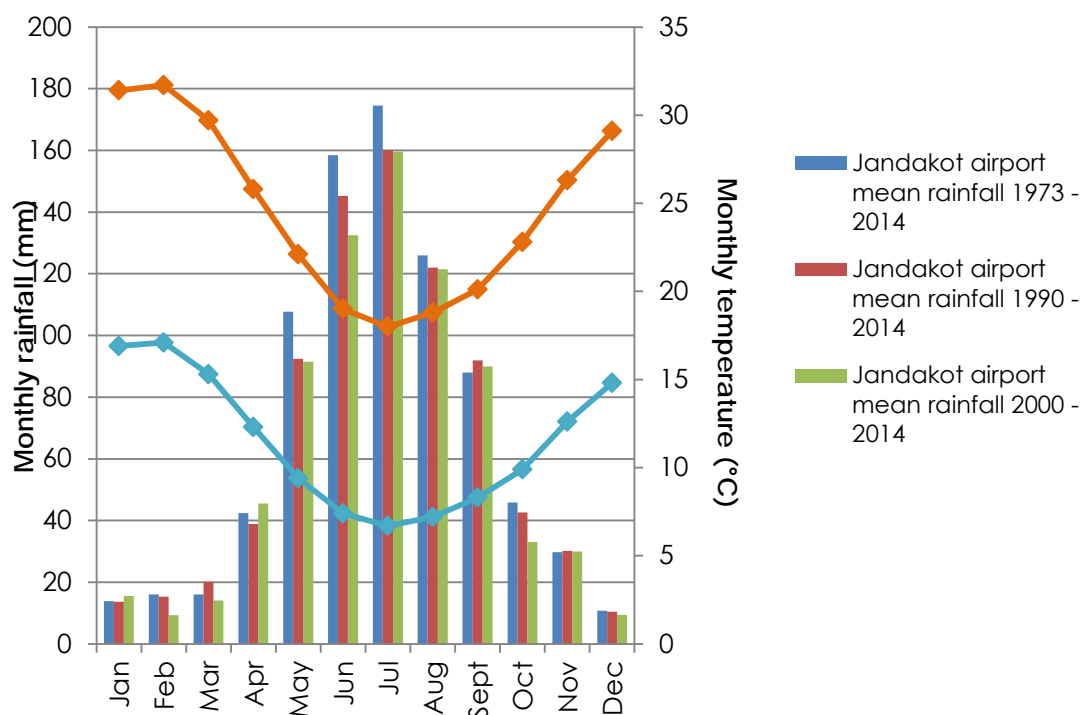


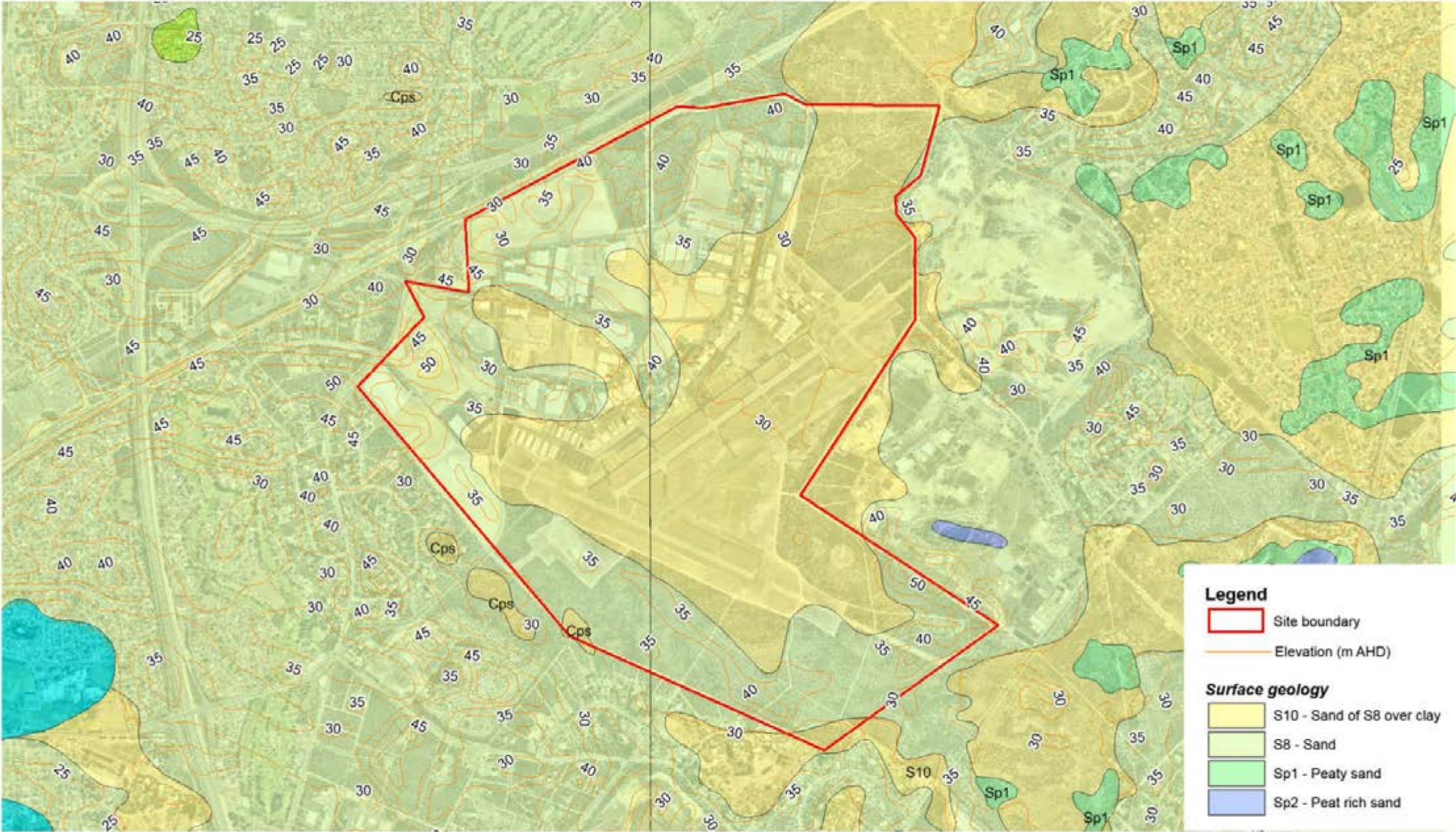
Chart1: Climate summary data – Jandakot Airport (BoM, 2014)

#### 2.1.2 Topography and geology

The topography of the airport and surrounding areas is generally flat, with local variations in height of 20 m or less. Most of the site has an elevation of approximately 28-30 m AHD. High points of 40-45 m AHD occur in the south-eastern corner and within Precinct 1A (Figure 2).

The surface geology presented in Figure 2 comprises of fine to medium grained sand (S8) as a thin veneer over silts and clays in some parts (S10).

Jandakot Airport  
Local water management strategy  
Figure 2: Topography and surface geology



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Data source: Landgate, DMP. Created by: R. Mackintosh. Projection: MGA: zone 50.

Scale 1:25,000 @ A4

0 500 m



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### 2.1.3 Acid sulfate soils

According to Department of Environment Regulation mapping; there is a moderate to low risk of acid sulphate soils occurring within 3 m of the surface within the site, as indicated in Figure 3.

Consistent with the Department of Environment Regulation's guidelines, sites should be investigated for acid sulfate soils if any of the following are proposed:

- Soil or sediment disturbance of 100m<sup>3</sup> or in areas depicted in an ASS risk map as Class 1 (High to moderate risk).
- Soil or sediment disturbance of 100m<sup>3</sup> or more with excavation from below the natural water table in an area depicted on an ASS risk map as Class 2 (moderate to low risk).
- Lowering of the water table (i.e. dewatering), whether temporary or permanent, in areas depicted in an ASS risk map as Class 1 or Class 2.

Groundwater is identified as being located approximately 4-5 m below the natural surface. Any construction activity expected to require temporary or permanent dewatering should trigger consideration and investigation of acid sulfate soils.

### 2.1.4 Contaminated sites

A search of the Department of Environment Regulation's contaminated sites data base identified no known or suspected contaminated sites within the study area. A group of three lots classified '*Remediated – restricted use*' are located on the eastern boundary of the site. These lots were formerly used for sand extraction and have been subdivided to form 30 lots, some of which contain residential dwellings. The registered sites are located to the south east (hydrologically up gradient) of the subject land.

It is acknowledged, considering the past and current activities associated with an operational airport, that a number of potential sources of contamination may be present within the airport boundaries. Contamination and contaminated sites are managed in accordance with the *Airports (Environment Protection) Regulations 1997*. JAH is required to maintain an Environmental Site Register that includes records of known and suspected contaminated sites. Sites are ranked according to the nature of contamination and risks posed. Where investigation identifies sites as requiring remediation or ongoing monitoring, appropriate plans are developed and implemented.

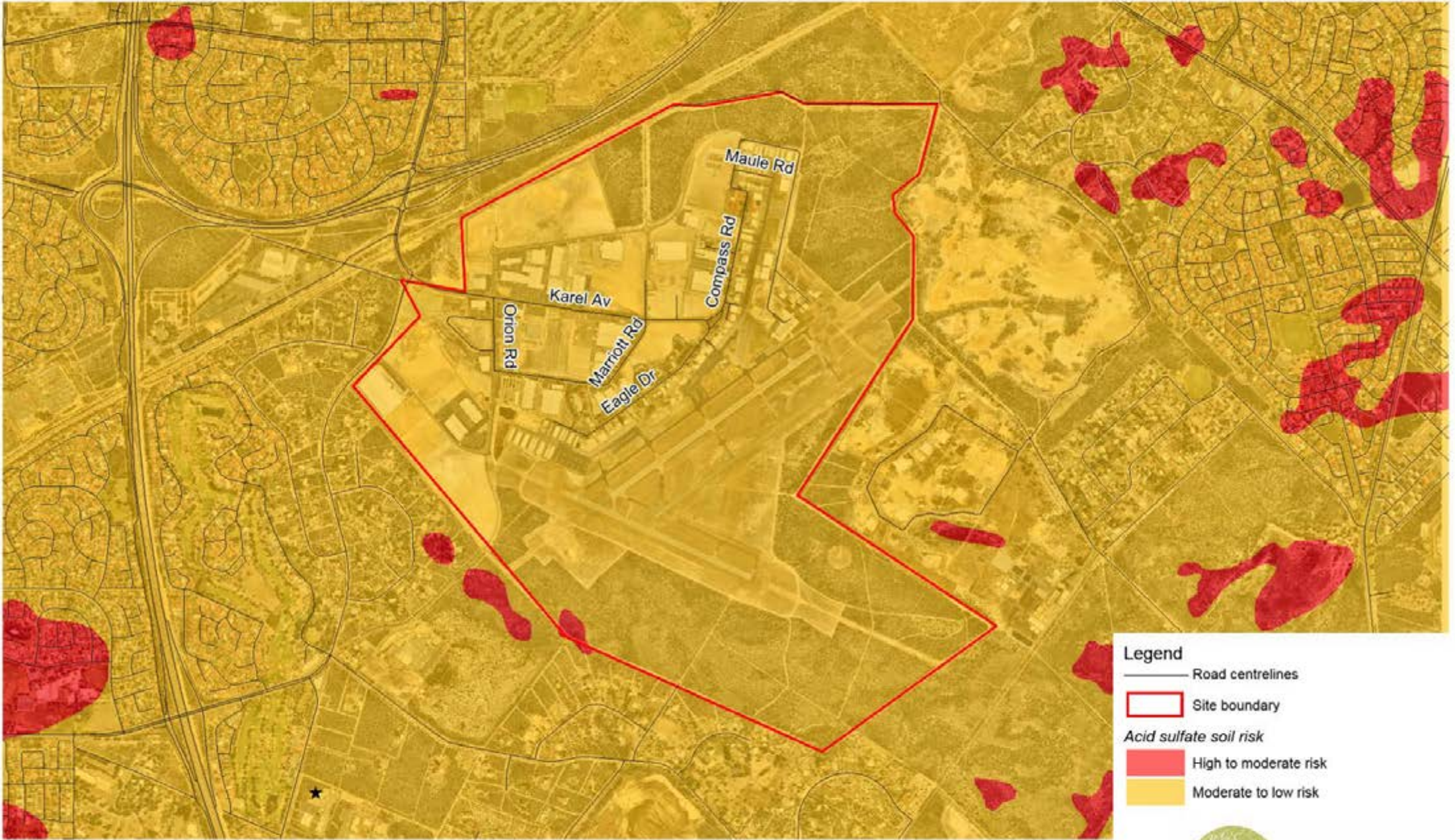
None of the contaminated sites on the Environmental Site Register are located within the JUWPCA.

### 2.1.5 Environmental assets

There are several seasonal damplands (resource enhancement) identified in the Department of Parks and Wildlife's geomorphic wetlands dataset. These are largely located outside the boundaries of the Airport land with the exception of one which is located within the conservation area (Precinct 1A) to the north eastern corner of the Airport and one located within the conservation area (Precinct 2A) to the south eastern corner of the Airport.

Conservation Precincts as designated in Master Plan 2014 are considered environmentally significant primarily due to the presence of banksia woodland, which provides foraging habitat for Carnaby's Cockatoos (*Calyptorhynchus latirostris*). In addition, the presence of the Grand Spider Orchid (*Caladenia huegelii*) in Precinct 1A and to a lesser extent Precinct 1B, adds to the significance of these specific areas. Vegetation within the Conservation Precincts mainly comprises low banksia woodland with dense understory.

Jandakot Airport  
Local water management strategy  
Figure 3: Acid sulfate soils



**Legend**

- Road centrelines
- Site boundary
- Acid sulfate soil risk**
  - High to moderate risk
  - Moderate to low risk

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Data source: Landgate, DER. Created by: R.Mackintosh. Projection: MGA: zone 50.

Scale 1:25,000 @ A4  
0 500 m



### 2.1.6 Surface water

No natural surface water features are located within the study area. Naturally there would be little runoff generated in the study area with most rainfall directly recharging the Jandakot mound groundwater aquifers by infiltration through the predominantly sandy soils. In larger storm events runoff would flow to one of the several low points present at the northern and western boundaries of the site where seasonal damplands have been identified.

### 2.1.7 Groundwater

Jandakot Airport is underlain by the Jandakot groundwater system. The Jandakot groundwater system provides water for public open space, horticulture, industry and gardens, and contributes to Perth's public water supply. The system comprises three main aquifers:

- the shallow unconfined Superficial (water table) aquifer known as the Jandakot Mound
- the deeper, mostly confined Leederville aquifer
- and the deeper, mostly confined Yarragadee aquifer.

Groundwater levels across the Jandakot Mound have declined over the last 30 years, but at a slower rate than seen in the Gnangara Mound (DoW 2014). This is due to a combination of factors including:

- the Jandakot Mound receives more rainfall than the Gnangara Mound
- abstraction pressure on the Jandakot Mound is less than on the Gnangara Mound
- large parts of the Jandakot Mound are now urbanised, which has increased recharge.

#### Ministerial criteria sites (Jandakot Mound)

The Jandakot Mound is gazetted under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* as an Underground Water Pollution Control Area (UWPCA), a public drinking water source area. The Department of Water is bound to manage abstraction of groundwater for public and private water supply from the Jandakot Mound with provision for environmental water requirements, as documented in Ministerial statement 688. The statement sets environmental water provisions in the form of water level criteria at 23 sites across the Jandakot Mound. These sites include 10 wetland sites, nine terrestrial phreatophytic vegetation monitoring sites (phreatophytic vegetation is vegetation that utilises groundwater to meet at least part of its water needs) and four rare flora sites. Some sites have more than one water level criterion. Water level criteria include:

- absolute minimum water levels
- rate of decline and timing of drying (referred to as other water level criteria) .

The Department is bound through the statement to manage abstraction and/or development to meet these water level criteria to achieve set objectives including:

- manage abstraction of groundwater for public and private water supply from the Jandakot Mound sustainably
- protect significant environmental values of groundwater dependent ecosystems
- minimise environmental impacts associated with abstraction .

Any proposed developments or groundwater license applications under the *Rights and Water Irrigation Act 1914* located in close proximity to Ministerial Criteria Sites (Figure 4) will be required to demonstrate negligible impact on these receptors.

There are a number of ministerial criteria sites (rare flora) located within (JM7) and adjacent to the Airport. According to the most recent Department of Water compliance report (DoW 2013) these sites are currently compliant with relevant groundwater level criteria. Previous non-compliance has occurred at these bores; with water levels declining by greater than 0.1 m/year during 2006/07 and 2010/11. These sites have been compliant in all other years since 2000.

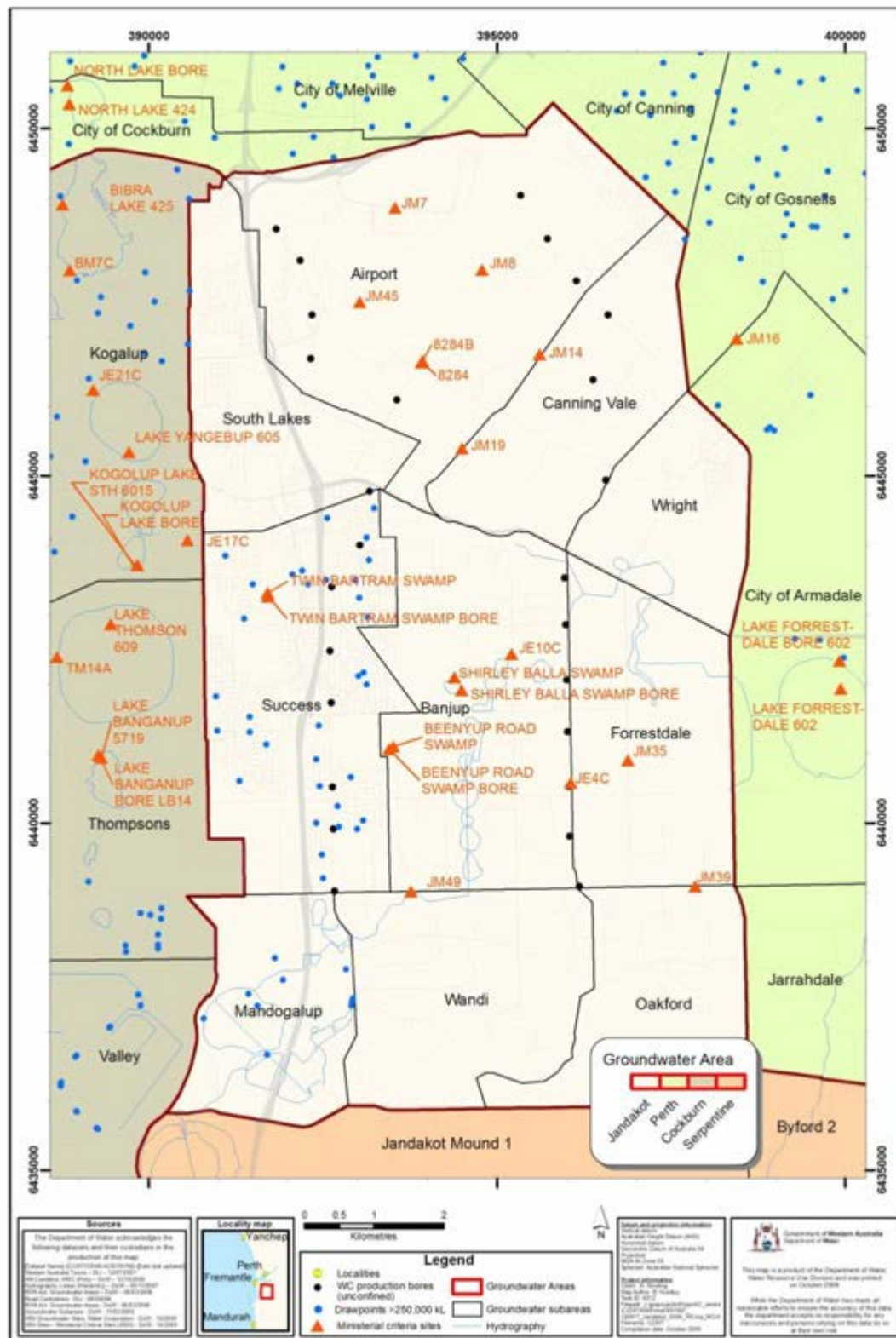


Figure 4: Jandakot groundwater system – location of Ministerial sites (DoW 2013)

### Groundwater levels

The Perth Groundwater Atlas (WRC 1997) indicates that regional groundwater flows in a north westerly direction, towards the coast and Swan River (as shown in Figure 5). The historical maximum groundwater level lies at approximately 26 to 28 m AHD. Given that elevation at the site varies between approximately 30 and 50 m AHD, this suggests that the minimum depth to groundwater at the site is approximately 4 m below ground level (BGL).

Groundwater levels have been monitored on since March 2012 at nine locations across the Jandakot Airport estate (Chart 2), with an additional two locations added to the monitoring program in December 2013. The maximum measured groundwater level during the monitoring period has varied between 2 and 12 m below ground level. Although it is not possible to determine if annual minima and maxima have been recorded each year, the timing of monitoring events has been designed to capture the groundwater level close to its annual maximum and minimum. Groundwater monitoring locations and levels recorded in September 2013 (approximate maxima) are presented in Figure 5.

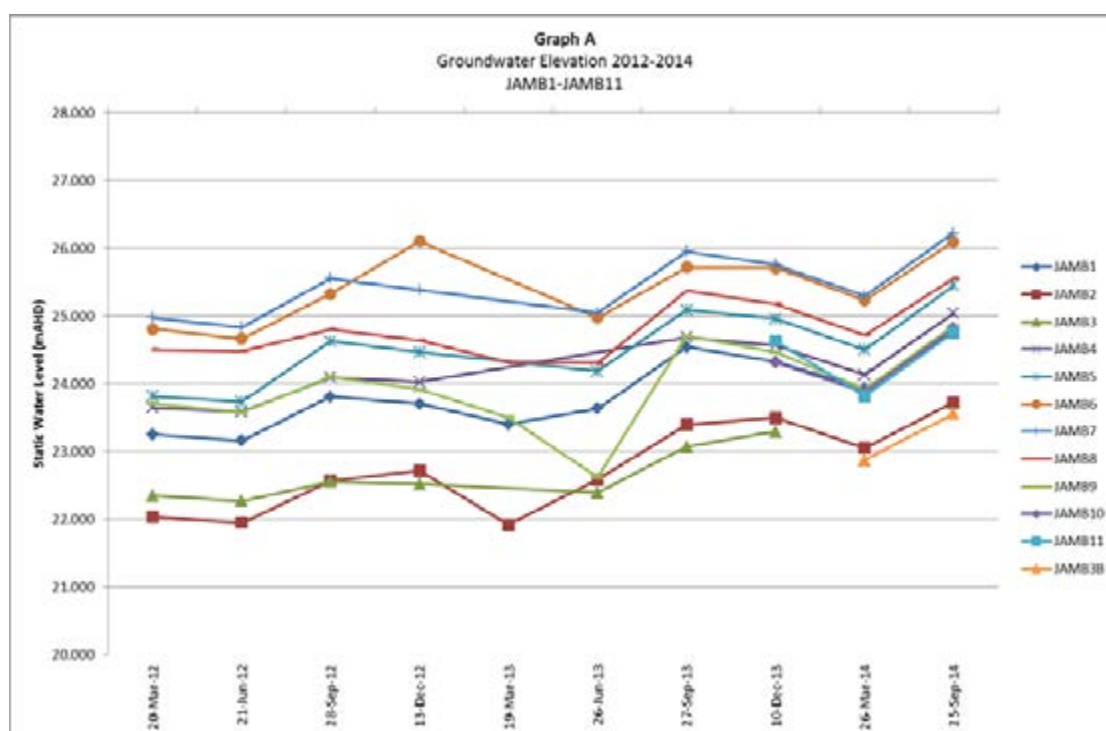


Chart 2: Available groundwater level data

### Groundwater quality

Groundwater quality has been monitored since March 2012 at nine locations across the Jandakot Airport estate, with an additional two locations added to the program in December 2013. Groundwater monitoring locations and summary quality data are presented in Figure 6. Tables extracted from the 2013-2014 Annual Groundwater Monitoring Report (Coffey 2014) are provided in Appendix 1. The following are summary observations based on the available monitoring data:

- In situ measurement of pH values of groundwater range from 3.4 to 6 with an average pH of 4.52, indicating acidic conditions.
- Levels in exceedance of *Airports (Environment Protection) Regulations 1997* triggers for total nitrogen were recorded across all nine bores with similar results for total phosphorous.

- With the exception of aluminium, zinc and iron, detected concentrations of metals and arsenic are below or marginally above guidelines.
- Petroleum hydrocarbons are stored on-site, however available groundwater data does not identify any adverse impacts from airport activities.

Low pH values are sometimes due to organic acids resulting from decomposition of vegetation in swampy environments (Davidson 1995). This is natural acidification through CO<sub>2</sub> production and root respiration in the soil in such environments. Appelo and Postma (2005) identified the lowest pH from CO<sub>2</sub> production in soil is around 4.6, so that groundwater which has a lower pH value must involve other processes of acidification.

A second possible source of acidification is the excessive use of ammonia and manure fertilisers. Another major acidification process is the oxidation of pyrite (FeS<sub>2</sub>). Pyrite is found, at least in small quantities, in most reduced sediments in the Bassendean Sand and swamp and lacustrine deposits at shallow depth. The lowering of the watertable by climate variability or from public and/or private abstraction may cause the oxidation of pyrite.

Groundwater monitoring at up-hydraulic locations (JAMB5,6,7,8,9) identifies groundwater quality of a similar acidity which suggests the low pH levels are a regional issue and that conditions local to the Jandakot airport do not contribute significantly to the acidity of the regional aquifer (Coffey, 2014).

Onsite nutrient sources, nitrogen and phosphorous, include sewage/wastewater and chemical applications to the soil. Historically leasehold sites at Jandakot airport disposed of domestic wastewater via septic tanks and aerobic treatment units (ATU's). Minor fertilising of the airfield grassed areas and phosphite treatment of dieback has occurred onsite. No onsite point of source of nutrient contamination or on-site diffuse source has been identified. It is inferred it likely to be a regional issue with up-hydraulic groundwater monitoring showing similar results. All new developments within the airport shall be connected to reticulated wastewater system, furthermore existing septic and ATU's are to be progressively made redundant, consistent with commitments within Master Plan 2014.

Elevated levels of aluminium, zinc and iron are present across all monitoring bores of the site. The presence of the metals is considered due to the acidification of the regional aquifer, possible due to acid sulphate soils. Concentrations do not show clear trends correlating with on-site activities or potential sources.

Monocyclic aromatic hydrocarbons and total recoverable hydrocarbons were reported below laboratory limits of reporting for bores JAMB1-JAMB11, with the exception of JAMB8 in December 2013 and March 2014, when levels for TRH >C<sub>16</sub>-C<sub>34</sub> were at laboratory limits of reporting (i.e. 0.1 mg/L) but well below criteria. It cannot be determined from the data collected if the concentrations are from a petroleum source and the elevated levels are considered likely to be from a naturally occurring oils, given the large hydrocarbon chain length (TRH >C<sub>16</sub>-C<sub>34</sub>).

Monitoring bores situated within the site located on the southern boundary, up-gradient of any site operations, are considered to represent background conditions of groundwater entering the site. Generally trends show there is no evidence of groundwater degradation associated with site operations, therefore risk to receptors such as Jandakot Mound, onsite users and workers is considered low.

#### Groundwater flow and contaminant modelling

The majority of Precinct 5 and approximately half of Precinct 6/6A are within in the Jandakot Groundwater Mound Area. A hydrological assessment of the impacts of the development at

Jandakot airport on the downstream public water supply has been conducted (Cymod, 2009) as the proposed development area is presently a Priority 1 groundwater protection zone.

The investigation simulated both long term contamination and a single accident contamination. It was found that exceedance of drinking water criterion at downstream locations would occur after more than 10 years, minimum for both cases, with an average of 20 years.

The investigation found that in a single accident contamination, the area can be effectively remediated using aquifer restoration via conventional recovery bores. Long term contamination however, is less likely to be successful using recovery bores, and management plans should be developed to minimise long term contamination risks. It has been ascertained by the inclusion of non-structural and structural storm water controls and risk assessments that Precincts 5 and 6/6A can be developed without posing additional risks to water resources (CyMod 2009).

### Groundwater availability

The site lies within the Airport and Jandakot Confined subareas of the Jandakot groundwater area. Groundwater is not available for allocation licensing to private users within the Leederville or Yarragadee Aquifers because the water is reserved for public water supply (shown in Table 1). Groundwater is available for private licensing within the Superficial Aquifer and Jandakot Airport Holdings currently hold a license for 225,000 kL from this resource.

**Table 1: Groundwater allocations**

Subarea	Aquifer	Allocation limit – private users (kL/year)	Availability (Jan 2015)
Airport	Perth – Superficial Swan	1,656,932	Yes
Jandakot	Perth - Leederville	0	No
Confined	Perth – Yarragadee North	0	No

### Groundwater use

Groundwater is used within the Jandakot Airport estate for irrigation of areas of landscaping abstracted under Jandakot Airport Holdings (JAH) current groundwater licence (GWL95741 (4)). The license is held for 225,000 kL of groundwater from the superficial aquifer based on a rate of 7,500 kL/ha of irrigated lawn/garden area. Current uses for groundwater are summarised as follows and areas are estimated in Table 2:

Airside: Approximately 9.6 ha grass/lawn irrigation. The watering of lawn/grass areas in the airside area is undertaken for two reasons. (1) To provide stable grassed areas for aircraft parking; and (2) for aircraft safety purposes, such as dust management and soil stabilisation in the vicinity of aircraft movement areas.

Landside: Irrigation of approximately 3.4ha of lawns and gardens, including verges, median strips and amenity garden beds. This area is likely to increase in future years as development in the landside aviation precincts expands. Bore irrigation systems are likely to be further expanded to water areas that are currently irrigated with potable (i.e. mains) water and treated effluent (noting many tenants currently irrigating with effluent will eventually be connected to deep sewer and will need an alternative water source for their gardens).

New Commercial: Irrigation of 2.8 ha of lawns and gardens, including verges, median strips and amenity garden beds. The area under irrigation is likely to increase as development of commercial areas increases significantly in the next few years.

**Table 2: Irrigation Area estimates**

Areas	Previous Areas	Current (2014) Areas	*Future Estimates - 2019
Airside	9.6 ha	9.6ha	10ha
Landside	2.4 ha	3.4 ha	5 ha
New Commercial	3.8 ha	2.8ha	15 ha

\*Unconfirmed estimates only, calculated for the purpose of this report.

Additionally, groundwater is used from designated bores (currently 8 and 13) for construction activities – notably dust suppression, road construction, site levelling, compaction etc. From late 2014 Bore 13 was used for both construction and verge irrigation within the newly developed Precinct 5. A new bore, located within or in the vicinity of Precinct 6, will likely be established for the clearing and development of Precincts 6 and 6A.

Major constructions involving bulk earthworks/activities are anticipated to continue for the next 3-5 years. This includes development of the Commercial Precincts as well as the planned 4th Runway and associated works. Water use for construction is likely to continue at the current rate for another two to three years, after which it will be reduced.

Large Bulk earthworks (e.g. levelling and compaction) require approximately 450kL per day of operation, and cutting to level and other activities generally utilises 100kL/day per day of operation.

In 2013/14, JAH used 265,164 kL which is 40,164 kL (18%) above the license limit. Of this amount, 72,518 kL (27%) was used for construction purposes, which is a temporary use and will decrease over time. The use of water for construction was marginally greater than in 2012/13.

**Table 3: Annual water use from July 2013 to June 2014.**

Bore ID	Status	Primary use	Annual use (kL)
1	Operational	Landside – Irrigation	24,281
2	Operational	Landside – Irrigation	341
3	Operational	Landside – Irrigation	18,831
4	Operational	Airside - Irrigation	39,696
5	Operational	Landside – Irrigation	17,616
6	Operational to May '14	Commercial -Construction	19,150
7	Operational	Airside - Irrigation	5,862
8	Operational	Landside – Minor Irrigation	5,108
9B	Operational	Airside - Irrigation	3,323
10	Operational	Airside - Irrigation	28,664
12	Operational	Commercial - irrigation	47,524
13	Operational	Commercial -Construction	53,368
14	Operational	Tenant –irrigation.	1,400
<b>Annual Water Use (kL) - Total</b>			<b>265,164</b>
<b>Annual Water Use (kL) - Irrigation</b>			<b>192,646</b>
<b>Annual Water Use (kL) - Construction</b>			<b>72,518</b>

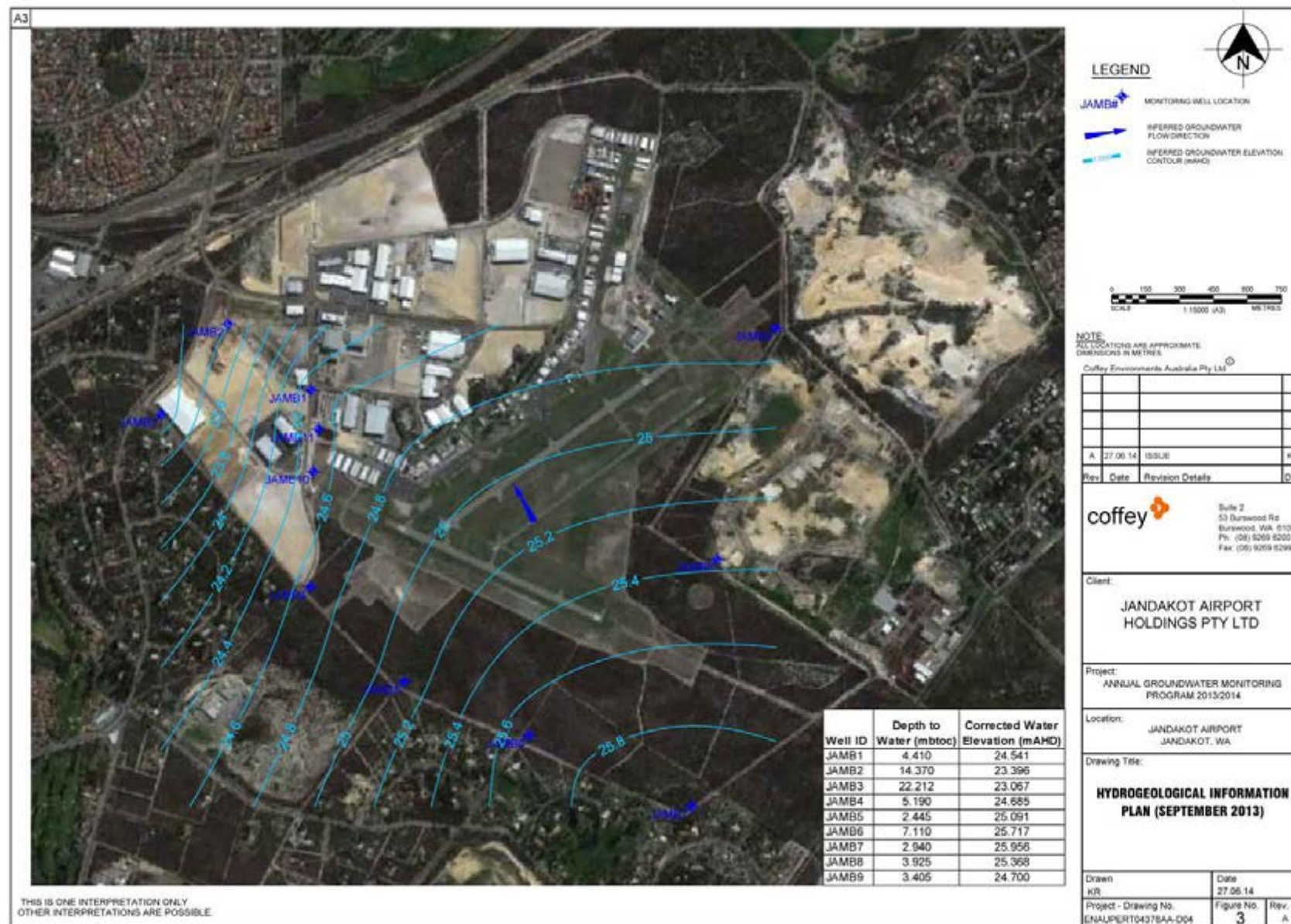


Figure 5: Groundwater monitoring network and mapped groundwater levels (September 2013)

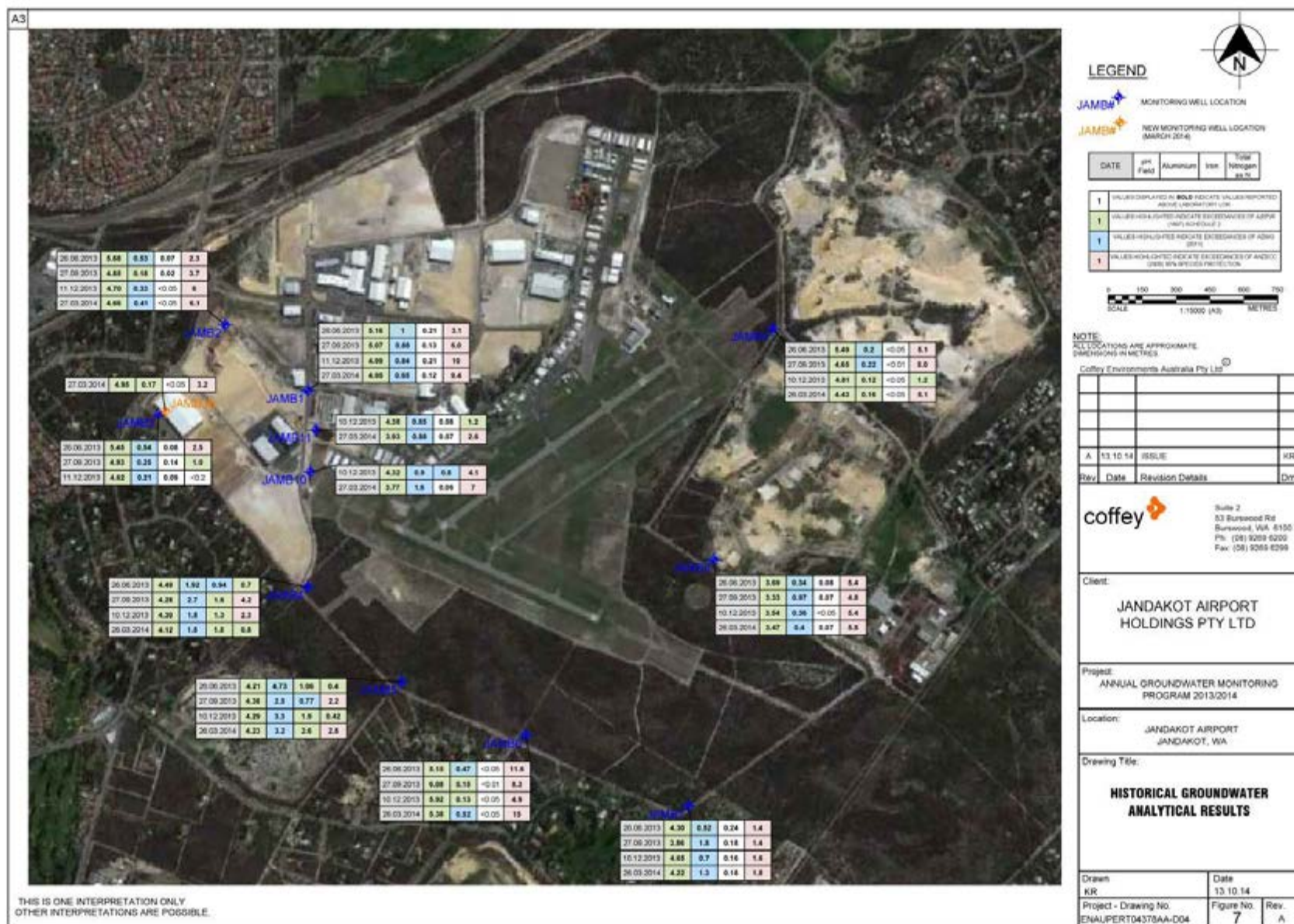


Figure 6: Groundwater monitoring network and mapped summary analytical results (2013)

## 2.2 Social and economic

### 2.2.1 Heritage

The Jandakot Airport Heritage Management Plan (Appendix I to the Conservation Management Plan) was developed to ensure that JAH conducts its developments in a manner that complies with the *Airports Act 1996* and other statutory requirements in relation to areas of cultural significance.

No European heritage sites have been registered within the City of Cockburn Local Government Inventory and Heritage List, the State Heritage Register or the Commonwealth Heritage List. There are also no visible signs of European heritage on site.

Prior to the approval of the Jandakot Airport Master Plan 2009 and Environment Strategy 2009, JAH engaged Australian Interaction Consultants (AIC 2008) to undertake an Ethnographic and Archaeological Site Identification Survey of the areas to be impacted under the Jandakot Airport Master Plan 2009. The surveys, involving archaeologists and indigenous custodians, encompassed the entire airport including all areas of development to which this LWMS applies.

Archival research revealed two sites (artefact scatters) which were believed to be within the airport boundary; Site 4309 Princep Road and Site 3513 Lukin Swamp. The 2008 investigation concluded:

- no new ethnographic or archaeological sites were identified
- Site 3513 Lukin Swamp could not be located within Jandakot Airport and previously identified Site 4309 Princep Road is no longer a site within the meaning of Section 5 of the *Aboriginal Heritage Act 1972*
- a Section 18 application is not required for the Jandakot Airport Master Plan to proceed.

However, the potential for ground disturbing activities to encounter previously unknown archaeological deposits (which may contain cultural materials) was noted and JAH addresses this within the Cultural Heritage Management Plan and relevant Construction Environment Management Plans.

### 2.2.2 Land use

#### Jandakot Airport Master Plan 2014

The Jandakot Airport Master Plan 2014 defines land use precincts within the estate (presented in Figure 7) as:

- Precinct 1A (48 ha) – Conservation;
- Precinct 1B (31 ha) – Conservation;
- Precinct 2A (29ha) – Conservation;
- Precinct 2B (11 ha) – Conservation;
- Precinct 3 (250 ha) – Aviation Operations;
- Precinct 4 (117 ha) – Mixed Business (previously Precincts 4A, 4B, 4C and 4 under the Master Plan 2009);
- Precinct 5 (41 ha) – Mixed Business;
- Precinct 6 (37 ha) – Mixed Business (Previously 'Future Development' under Master Plan 2009); and

- Precinct 6A (10 ha) – Aviation Operations (Previously 'Future Development' under the Master Plan 2009).

The remainder of the 622ha site is allocated to roads and services.

### City of Cockburn Local Planning Scheme No. 3

The Jandakot Airport estate is currently zoned 'Public Purpose – Commonwealth Government' under the City of Cockburn's Town Planning Scheme No 3 and is covered by the 'Jandakot Airport Special Control Area'.

The ongoing aviation use and development of Jandakot Airport is supported through the Local Planning Scheme, such that land surrounding the airport has been zoned 'Resource' so as to prevent more intensive residential development which may be sensitive to aircraft noise.

### Metropolitan Region Scheme

Jandakot Airport estate is reserved for 'Public Purposes: Commonwealth Government' under the Metropolitan Region Scheme (Figure 8). Additionally, the entire estate is identified as 'Bush Forever Area' whilst only western and southern portions of the site are contained within the 'water catchments' reserve which coincides with the boundary of the JUWPCA (Figure 9).

The MRS does not place any limitations on permissible uses in the designated reservations. That is, under the provisions of the MRS, any use can be approved on any reserved land. The 'Public Purposes: Commonwealth Government' and 'Water Catchments' reservations, and 'Bush Forever Area' identification do not prevent the approval of any use or development on the airport site.

Current land use zoning and reservations in the area surrounding Jandakot Airport, as depicted in the Metropolitan Region Scheme, include:

- *Public Purposes - Special Uses;*
- *Urban;*
- *Rural;*
- *Parks & Recreation;*
- *Industrial; and*
- *Rural – Water Protection.*

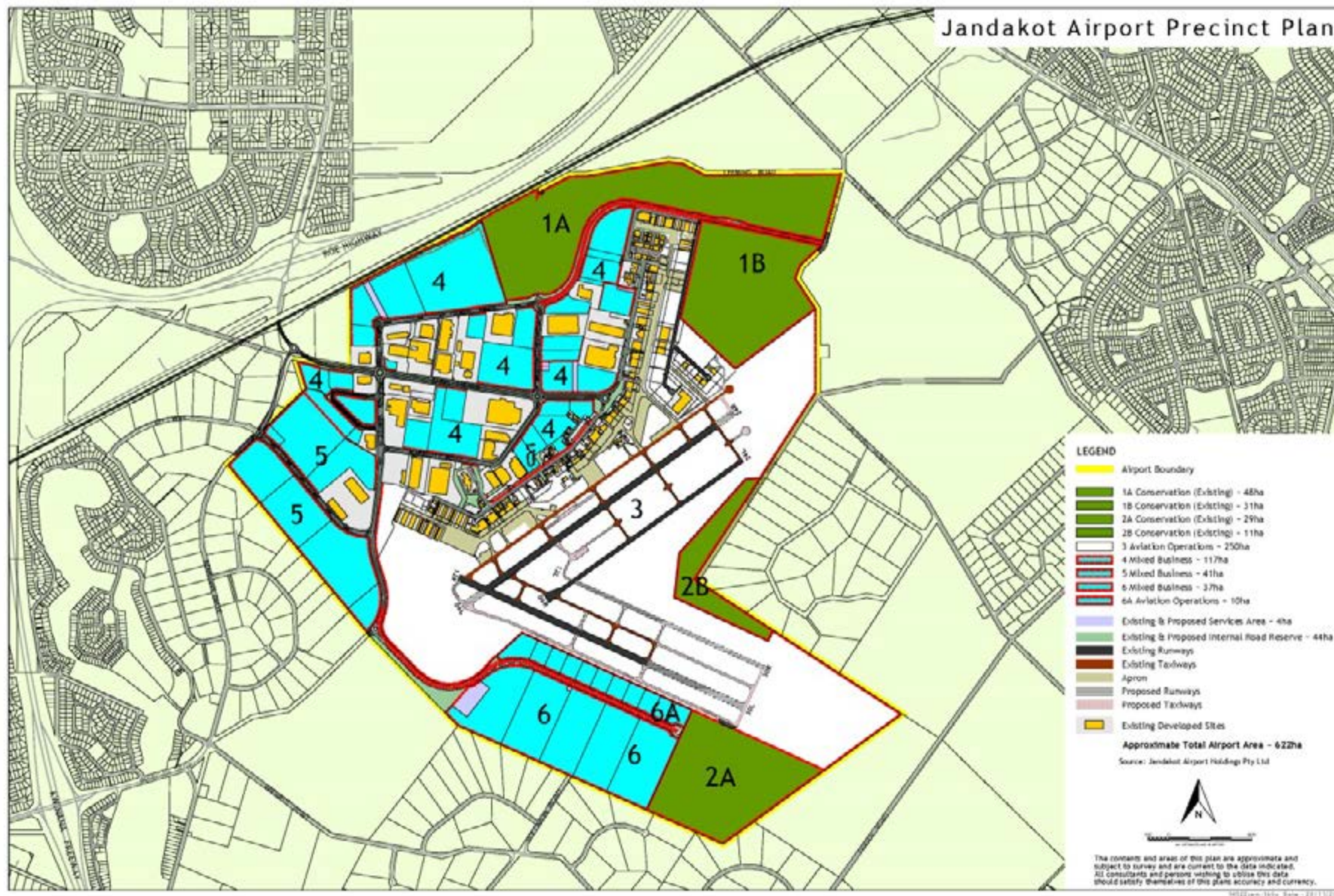


Figure 7: Precinct plan

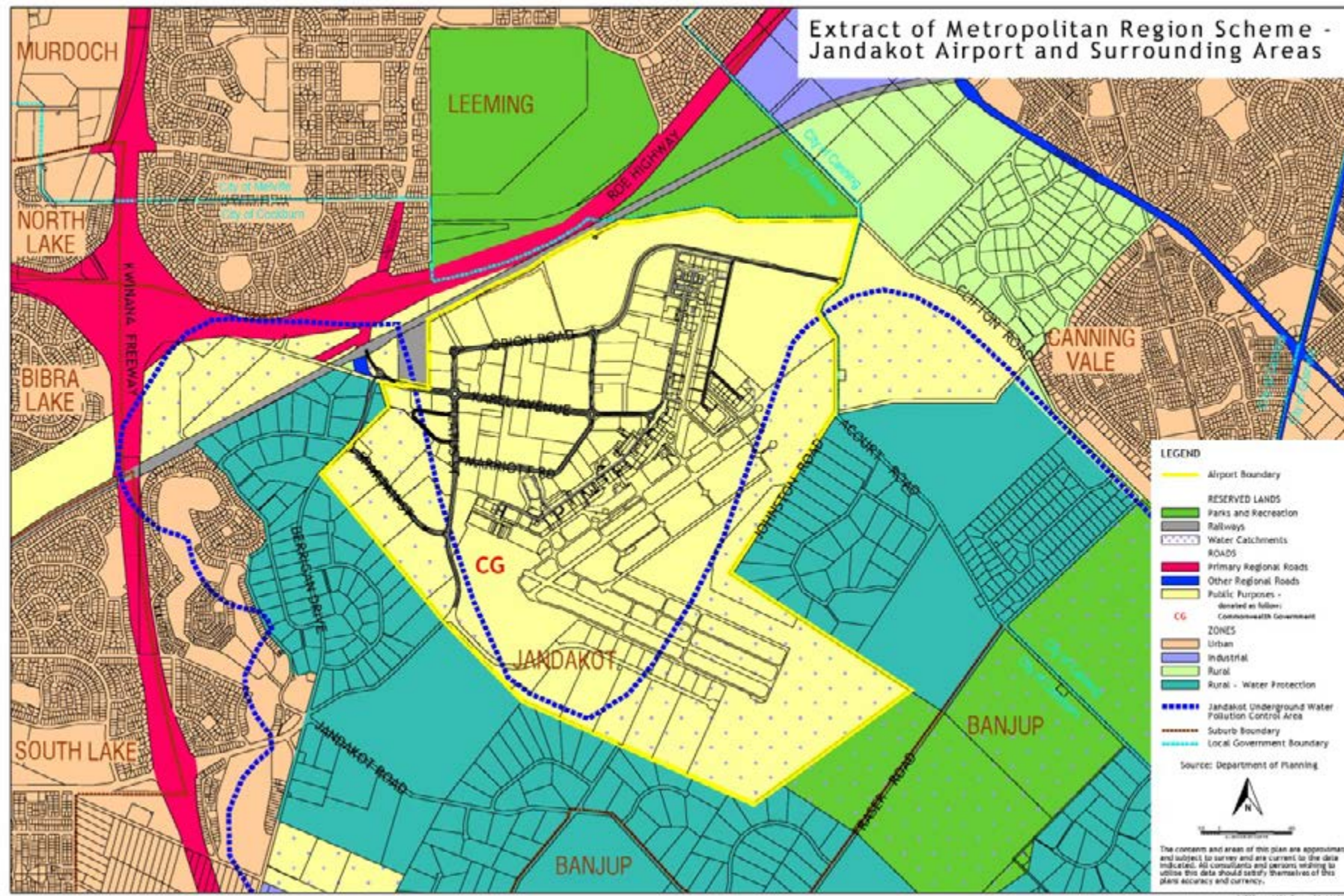


Figure 8: Metropolitan Region Scheme Zones and Reserves

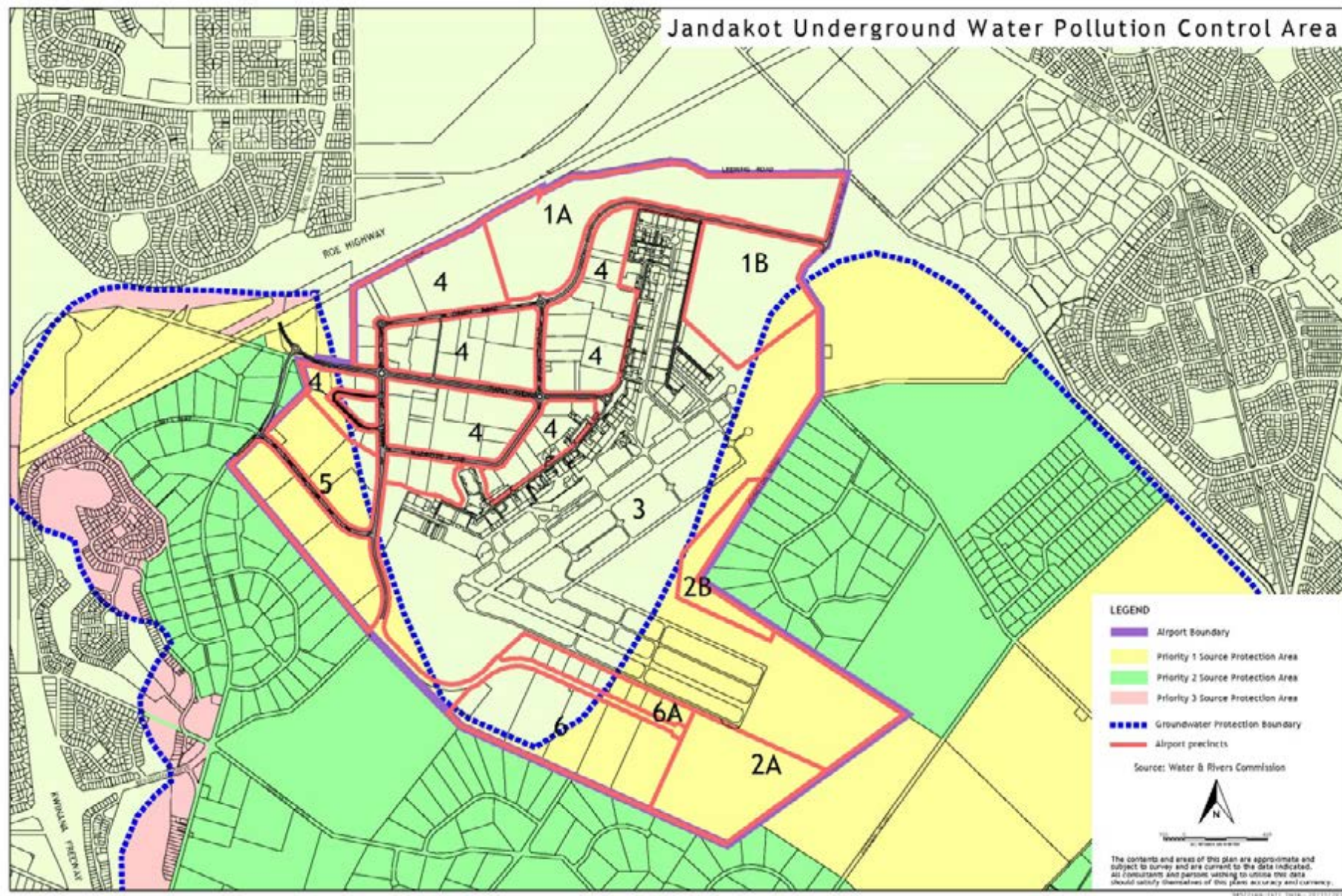


Figure 9: Jandakot Underground Water Pollution Control Area

### 2.2.3 Infrastructure

The Jandakot Airport estate contains substantial existing and proposed aviation infrastructure (see Figure 10) as well as associated roads and services infrastructure necessary to support aviation and mixed business land uses.

#### Wastewater

A reticulated sewerage network is present within the Jandakot Airport estate, connected to the local municipal sewerage system. This system currently services all new developments within Precincts 4 and 5, as well as some of the established areas of the airport. The sewer is a reticulated gravity system to the main internal pump station located on Marriott Road which is connected via a pressure main to the Bibra Lake main sewer. All proposed future developments within Precinct 6/6A will be connected to reticulated sewer.

Older, established areas of the airport will be progressively linked to sewer in coming years. The majority of pre-existing small tenants continue to operate septic tanks. Larger pre-existing tenants have aerobic treatment units (ATUs). In line with Master Plan 2014, JAH has committed to connecting all facilities to the sewer system by 2024 where feasible. Existing ATU's and septic tanks will be decommissioned and removed in accordance with the existing procedure which requires approval by the Department of Infrastructure and Regional Development (DIRD) Airport Building Controller.

#### Potable water

Jandakot Airport estate is connected to the Water Corporation's Integrated Water Supply System (IWSS) via a single 150mm metered connection at the northern boundary of the airport.

This metered connection is fed from a water reticulation main within the railway corridor that abuts a portion of the northern boundary of the airport. From the 150mm metered connection the water is fed via a pipeline that connects into the precinct reticulation network in the vicinity of the Orion Road and Marriott Road intersection.

In addition to the pipework, the current internal water infrastructure also consists of storage tanks connected to the incoming 150mm metered service. These storage tanks are fitted with booster pumps which are subsequently connected back into the internal feeder mainline. The booster pumps have been installed to maintain and regulate the internal mains reticulation pressure head during peak demand periods and fluctuating Water Corporation service pressures/flows.

An additional connection to the southern end of the airport is being investigated to negate the risk of a single water supply to the airport.

Fire services (hydrants) are compliant with Australian Standard 2419.1-2005.

#### Well Head Protection Zones

The Jandakot Airport estate contains part of a Well Head Protection Zone (WHPZ) associated with Water Corporation drinking water production bores J150 and J160. The WHPZ extends into precincts 1 and 3, is largely vegetated and contains no significant infrastructure.

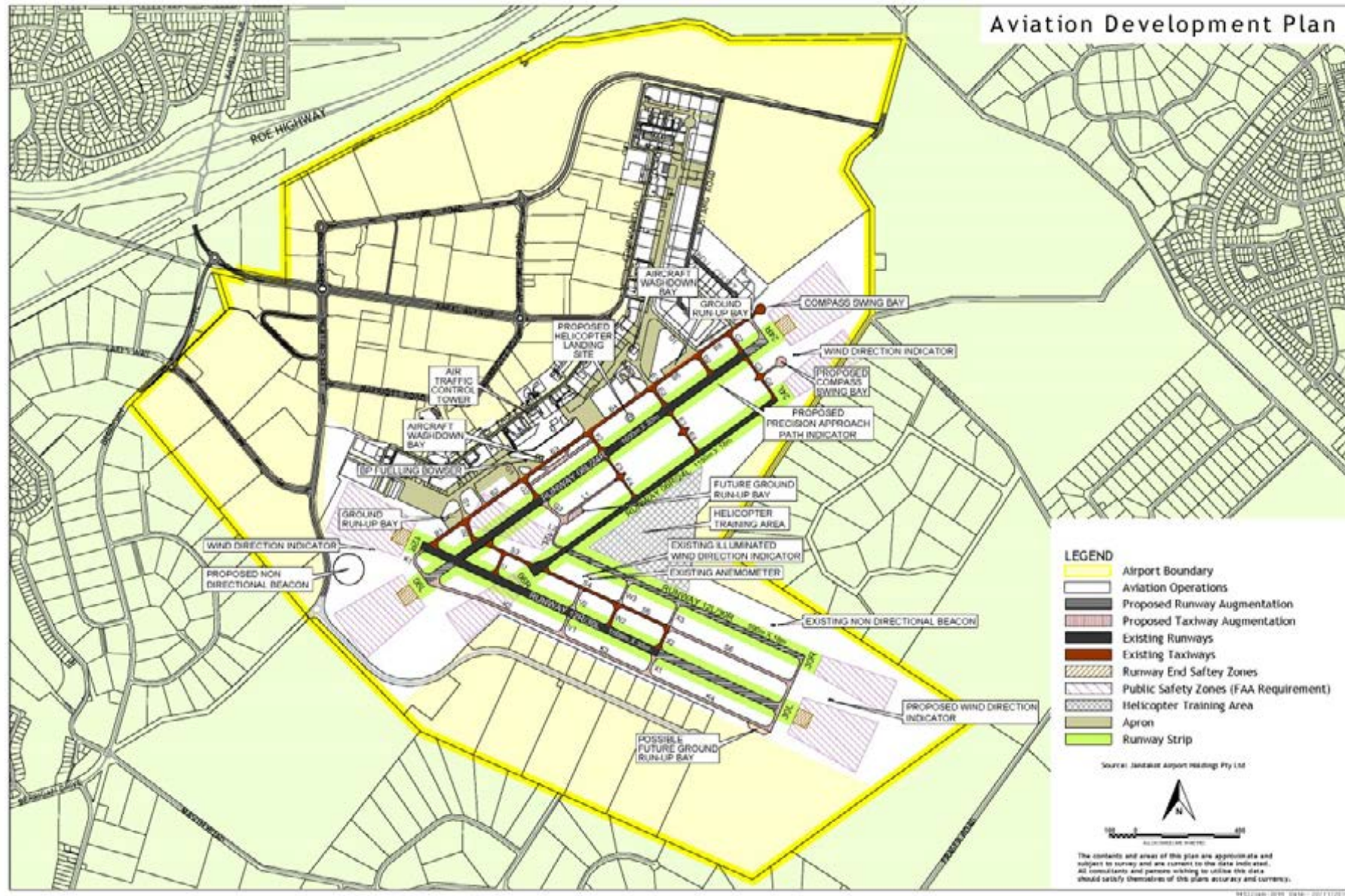


Figure 10: Aviation development plan

### Non potable water

In 2013/14, 13 groundwater draw points existed at Jandakot Airport (Figure 11). One bore (Bore 6) was decommissioned at the end of the financial year.



Figure 11: Groundwater Abstraction Bore Locations (photo source Google earth)

### Drainage

The prevailing soil conditions of highly permeable sands lend themselves to on-site stormwater disposal. Additionally, it is desirable to maximise recharge of the Jandakot groundwater system through promotion of infiltration at source wherever possible.

All existing lots within the Jandakot Airport estate manage stormwater on-site through provision of onsite retention of 5% annual exceedance probability event (AEP) storm events without ponding through use of soakwells or small infiltration areas within their respective lots. Developments are also required to attenuate the 1% exceedance probability event (AEP) storm event although some short duration ponding is accepted in these events. Larger storm events discharge into road reserves and are directed to open drains/swales and/or drainage basins.

Roads and aviation areas of the Jandakot Airport estate are served by a combination of open and piped drains connected to a small number of stormwater infiltration basins. Ponding within these basins rarely occurs even during large storm events with all existing stormwater basins observed to hold water for short periods after sustained rainfall of high intensity, avoiding the creation of habitats that might otherwise attract water birds (JAH 2014).

Treatment of stormwater run-off from paved areas, including runways and taxiways is provided through adjacent grassed areas or 'buffer strips' prior to discharge into the piped drainage system. The existing underground pipe network discharges to an open drain between the central and southern aprons, which directs flows to the basin at the north eastern end of the airport.

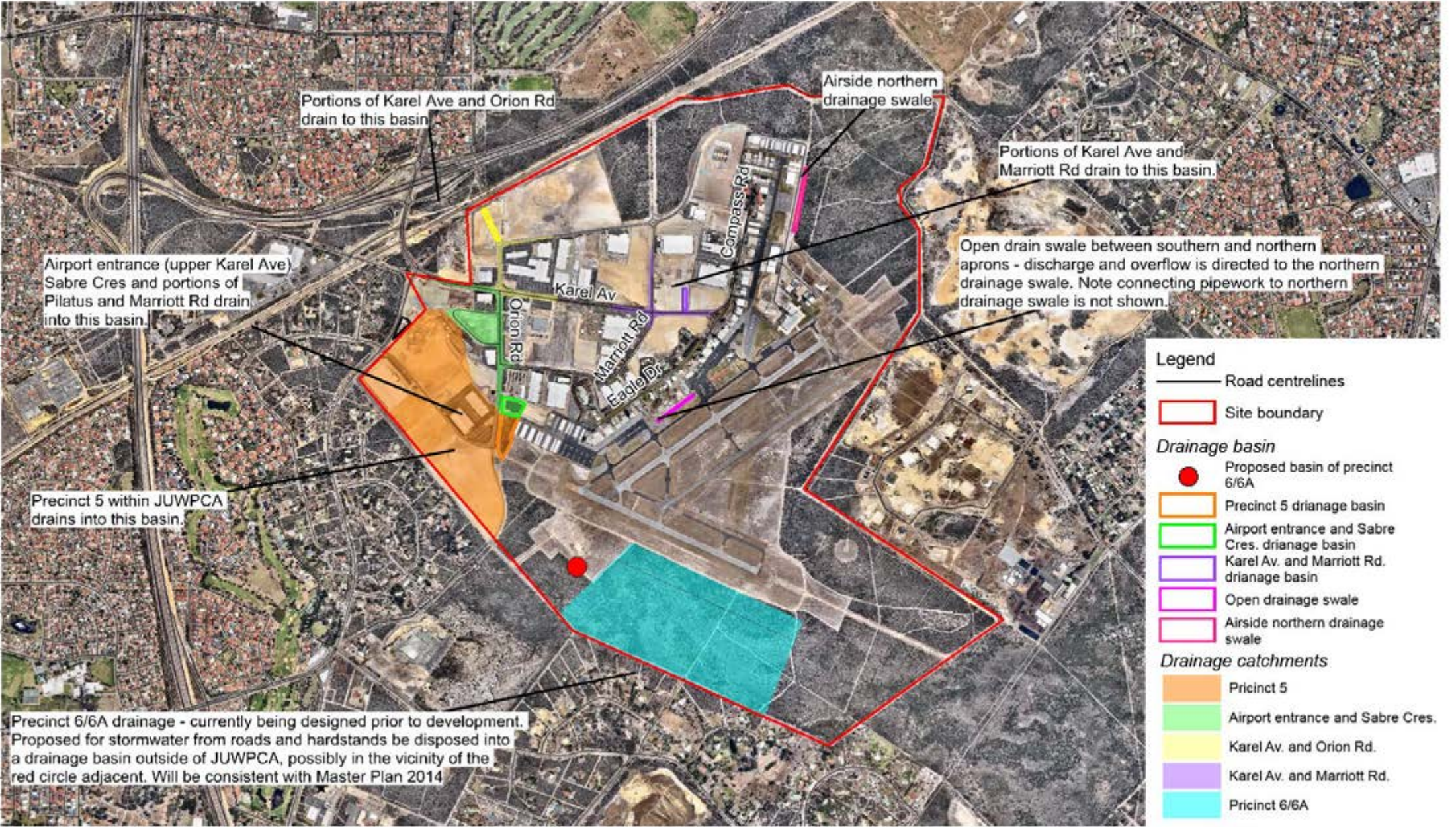
Drainage from aircraft wash bays is managed consistent with the Jandakot Airport Equipment and Washdown Policy, which requires appropriate treatment and disposal of water including the use of

approved interceptors and/or separators. Similarly, stormwater drainage from fixed refuelling areas is captured and discharged via purpose built plate separators or interceptor pits.

Within the JUWPCA stormwater management aims to promote infiltration at source for all stormwater collected from clean roof surfaces within all lots except where rainwater tanks are used. Stormwater from all roads, carparks and external hardstands within the JUWPCA is discharged via piped drainage networks into drainage basins located outside of the JUWPCA boundary and sized to cater for the 1:100 year/24hr ARI storm event.

Existing stormwater infiltration basins and their catchment areas are presented in Figure 12.

Jandakot Airport  
Local water management strategy  
Figure 12: Drainage catchment areas



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Data source: Landgate, Jandakot Airport. Created by: R. Mackintosh. Projection: MGA: zone 50.

Scale 1:25,000 @ A4



essential  
environmental

### 3 WATER MANAGEMENT STRATEGY

Limited future land use change is expected within the Jandakot Airport estate. Existing developed areas of the Jandakot Airport estate will retain their current Airport and mixed business land uses. Precinct 6/6A measuring 53 hectares, which has been previously managed for conservation pending "future development" under Master Plan 2009, will additionally be cleared and developed under Master Plan 2014.

The Jandakot Airport Master Plan 2014 identifies Precinct 6 for additional mixed business use development (approximately 43 ha) and Precinct 6A for aviation related development (approximately 10 ha).

This water management strategy has been developed to provide a consolidated approach to water management that is applicable to the Jandakot Airport estate with the inclusion of new development within Precincts 6 and 6A and ongoing development within Precinct 5.

#### 3.1 Objectives for water management

Water management objectives for the site have been developed with consideration of site specific issues identified in section 2. The objectives identified are also informed by statutory requirements, relevant policies, by-laws and guidelines including overarching objectives from *Better urban water management* (WAPC, 2008).

The site specific water management objectives are focussed on protection of public drinking water resources within the JUWPCA and maintaining the economic sustainability of Jandakot Airport into the future. Water management objectives are identified as follows:

- Prevent pollution of groundwater within the JUWPCA
- Contribute to improving the health and sustainability of the Jandakot groundwater system
- Provide a local drainage system with an appropriate level of amenity and safety during storm events
- Ensure the efficient use and re-use of water resources.

#### 3.2 Prevent pollution of groundwater within the JUWPCA

Key strategies are identified that are appropriate to achieve this objective are as follows:

- Implementation of the Local Water Management Strategy and Groundwater Management Plan.
- No bulk storage of potentially polluting chemicals within the JUWPCA
- Development of Construction Environmental Management Plans (CEMPs), Demolition Environmental Management Plans and Operational Environmental Management Plans (OEMPs) to reduce the risk of pollution on tenant sites.
- Undertaking tenant audits and inspections.
- Training and awareness programs (e.g. Site inductions, Tenant Environmental Handbook, spill response training, etc.).
- Mandatory reporting of all spills greater than 2L and all spills that have the potential to result in environmental harm (regardless of volume).
- Prior to the expiry, transfer or termination of a tenant lease or licence, an environmental site assessment is undertaken if the activities of the tenant are determined to have resulted in possible soil or groundwater contamination.

- All new developments are to be connected to reticulated sewerage.
- All existing buildings to be connected to reticulated sewerage by end of 2024 (excluding facilities where connection to reticulated sewerage is not feasible).

All lots within precincts 6 and 6A will be connected to reticulated sewerage via a local precinct gravity sewer network discharging to a new sewer pump station, to be located on the eastern boundary of Precinct 6. This Precinct 6 pump station will discharge the sewer via a pressure main into the existing gravity sewer within Orion Road. Once within the existing Orion Road gravity sewer network, it will discharge into the existing Wastewater Pump Station.

### 3.3 Contribute to improving the health and sustainability of the Jandakot groundwater system.

Key strategies are identified that are appropriate to achieve this objective are as follows:

- Any construction activity expected to require temporary or permanent dewatering requires consideration and investigation of acid sulfate soils.
- Maximise local recharge to the superficial groundwater aquifer through the use of distributed stormwater infiltration systems.
- Adopt a risk management approach to stormwater management for each land use:
  - Infiltrate uncontaminated stormwater runoff from roofs, paths and landscaped areas at source using soakwells, permeable paving or through direction of runoff to adjacent pervious areas.
  - Provide treatment of stormwater runoff from low risk areas of roads and hardstand areas in vegetated swales and buffer strips.
  - Manage stormwater quality from higher risk areas through appropriate treatment devices such as interceptors and/or separators.
- Street sweeping is to be implemented when warranted to reduce entrainment of contaminants via stormwater and to improve the efficiencies of the retention systems.
- Reduce groundwater demand through waterwise (preferably locally native) species selection, improved irrigation efficiency and hydro-zoning, and use of alternative water sources wherever possible.
- Minimise the use of fertilisers and pesticides in public and private open spaces.

### 3.4 Provide a local drainage system with an appropriate level of amenity and safety during storm events.

The design of on-site drainage systems will be undertaken applying the following strategies:

- Provide a minimum of 300 mm clearance for habitable floors from flooding in the 1:100 year Average Recurrence Interval (ARI) event in roads and the drainage system.
- All lots to provide onsite retention of 1:20 year ARI storm events without ponding through use of soakwells or infiltration areas within their respective lots.
- All lots to provide onsite attenuation of the 1:100 year/24 hr ARI storm event with overflows directed to road reserves and open drains/swales and/or drainage basins.
- Design developments such that roads are trafficable during the 1:20 year ARI flood event.
- Minimise ponding in all areas to avoid the creation of habitats that might attract water birds.
- Wherever applicable incorporate adjacent grass areas or buffer strips for stormwater discharge into the design of paved areas.

- Manage drainage from wash bays consistent with the Jandakot Airport Equipment and Washdown Policy, which requires appropriate treatment and disposal of water including the use of approved interceptors and/or separators.
- Design stormwater drainage from fixed refuelling areas to capture and discharge via purpose built plate separators or interceptor pits.

Additionally (or alternatively if applicable), within the JUWPCA:

- Promote infiltration at source for all stormwater collected from clean roof surfaces within all lots except where rainwater tanks are used.
- Collect and convey stormwater from all roads, carparks and external hardstands within the JUWPCA via piped drainage networks into drainage basins located outside of the JUWPCA boundary.
- Stormwater from taxiways and runways will be discharged in adjacent swales and grassed verges

All lots within Precincts 5, 6 and 6A will be required to implement at source infiltration consistent with these stormwater management strategies. A new drainage basin will be constructed outside the JUWPCA (preliminary location identified in Figure 12) and sized to cater for the 1:100 year/24hr ARI storm event of Precinct 6 and 6A areas within the JUWPCA.

Engineering designs for Precinct 5 and preliminary (50%) designs for precinct 6 and 6A are provided in Appendix 2.

#### 3.4.1 Mosquito control

Consistent with the need to avoid creation of areas of standing water within the Airport vicinity that might attract birds and thereby increase bird-strike risks, the study area does not contain mosquito breeding sites. However, mosquito breeding sites can occur in relatively small areas of standing water that may not be large or long-lived enough to attract birds. In the context of the development mosquito breeding can be controlled in the future urban environment by ensuring:

- shallow areas of standing water drain within three days of filling;
- areas of standing water are free from depressions, potholes and related irregularities;
- bank gradients are steep enough not to trap pockets of stagnant water;
- weeds are controlled in open drains and areas of standing water; and
- Drainage infrastructure and public open space areas will be designed to avoid the creation of new mosquito breeding sites.

The key strategy for the development is the prevention of standing water in drainage swales and treatment areas.

Where possible the inverts of open drains and culverts will be designed to be free draining with a minimum longitudinal grade of 1:1000. Where it is necessary to provide water storage below the invert of downstream stormwater infrastructure for water quality management or hydraulic controls then subsoil drainage will be provided no more than 500mm below the invert of the storage area to ensure drainage of the area will occur within a reasonable timeframe.

Regular inspections and maintenance (culvert and swale clearing) to avoid blockages and ponding should ensure adequate drainage and prevent occurrences of standing water.

### 3.5 Ensure the efficient use and re-use of water resources

The following targets and strategies are proposed:

- Groundwater use for irrigation should not exceed 7,500 kL/ha of irrigated open space.
- Promotion of water efficiency actions and appliances to existing and future tenants including the use of rainwater tanks for non-potable water demands where feasible.
- Water efficient appliances, fixtures and fittings to be promoted for use in all buildings.
- Waterwise landscaping and irrigation to be promoted in landscaped areas, consistent with the Jandakot Airport Landscape Design Guidelines.

#### 3.5.1 Potable water

All lots within precincts 6 and 6A will be connected to the Water Corporation's Integrated Water Supply System via DN200 water mains which are to be connected into the existing Pilatus Street water reticulation network.

It is not considered useful to undertake a potable water demand assessment for existing or proposed parts of the Jandakot Airport estate since the demand is highly variable and dependent on individual lot tenants and their businesses.

#### 3.5.2 Non potable water

Non-potable water demand within the Jandakot Airport estate is restricted to areas of landscaping which are irrigated using groundwater abstracted under Jandakot Airport Holdings (JAH) current groundwater licence (GWL95741 (4)). The license is held for 225,000 kL of groundwater from the superficial aquifer based on a rate of 7,500 kL/ha of irrigated lawn/garden area.

The estimated annual water use for irrigation (192,646 kL) during 2013/14 is within the currently licensed amount but exceeds the target rate of 7,500 kL/ha for the existing irrigated area of 16 ha. Planned development is expected to increase the irrigated area to 30 ha in total and so it will be necessary to improve irrigation efficiency overall.

To address the objectives outlined in section 3 and site specific constraints Jandakot Airport Holdings proposes to implement the following strategies and commitments specifically in relation to groundwater demand management:

- Engagement of turf/landscaping professionals for soil testing and advice on matters such as wetting agents, irrigation design and watering rates, and fertilisers.
- Ongoing review and improvement in order to
  1. abstract within the licenced limit, and
  2. work towards achieving an irrigation rate of 7,500kL/ha.
- Recording of monthly meter readings from all metered bores.
- Compliance with the winter sprinkler ban (1 June to 31 August each year) except for the use of water required for construction purposes, bore testing and the establishment of new lawns and gardens.
- Implement a water quality sampling program to ensure abstracted water is suitable for irrigation purposes.

## 4 IMPLEMENTATION

### 4.1 Monitoring

#### 4.1.1 Surface water

As surface water is unlikely to be present within the stormwater basins, surface water monitoring is likely to be unachievable.

Through consultation with key stakeholders (DIRD and DoW), it has been determined that monitoring groundwater at locations down gradient from the points of discharge/infiltration will be sufficient to detect any impacts on groundwater quality.

#### 4.1.2 Groundwater

The purpose of the groundwater monitoring program is to:

- Establish baseline groundwater conditions against which future changes/trends can be measured.
- Ensure that development and activities on the airport estate, particularly within the JUWPCA, are not impacting the quality of groundwater.

Groundwater monitoring is undertaken by suitably qualified professional consultants.

##### Bore Location

Nine groundwater monitoring bores were installed at Jandakot Airport in February 2012 (Figure 6) at the locations proposed within the original approved GMP (V3, August 2011). Following consultation with the DoW, a further two bores (JAMB10 and JAMB11) were installed in order to monitor groundwater quality immediately downgradient to stormwater infiltration basins located to the east of the JUWPCA boundary in the eastern portion of Precinct 5 with JAMB2 and JAMB3 providing additional, more removed coverage. Following construction of the Precinct 6/6A stormwater infiltration basin and based on its currently proposed location, it is considered that JAMB4 will provide suitable downgradient monitoring coverage.

Additional bores may be installed if warranted in future, depending on the infrastructure developed and the activities undertaken. Similarly, where existing bores are determined by the groundwater monitoring consultant to be immaterial or irrelevant in their contribution towards the purpose of the groundwater monitoring program, those bores may be omitted from the groundwater monitoring program or sampled at an amended frequency.

##### Sampling Frequency

In order to establish baseline groundwater conditions JAMB1-JAMB9 have been sampled quarterly for two years (i.e. a minimum of 8 sampling events). Essential Environmental have reviewed these monitoring results and consider that there are no issues that warrant ongoing quarterly investigation. The data collected has facilitated a review of assessment levels to adopt revised values for a number of analytes based on observed control sites (discussed further below).

Ongoing biannual monitoring will occur biannually in March and September to coincide with the anticipated highest and lowest seasonal groundwater levels.

Any additional monitoring bores installed (including JAMB10 and JAMB11) will be sampled concurrently with the sampling regime established for JAMB1-JAMB9 unless results warrant further investigation.

#### Suite of Analytes and Assessment Levels

The suite of analytes and relevant assessment levels that will be applied to the groundwater sampling program are detailed in Table 4.

Under the *Airports (Environmental Protection) Regulations 1997*, the accepted statutory limits of water pollution are defined in Schedule 2. Whilst Schedule 2 remains the statutory document, assessment levels (or 'trigger values') have been developed for the monitoring program to take into account local and site-specific baseline conditions when interpreting and reporting groundwater monitoring results.

When developing trigger values for water quality, *Australian and New Zealand guidelines for fresh and marine water quality* (ARMCANZ & ANZECC 2000) recommend the use of the 90<sup>th</sup> percentile of an observed control site where the aim is to maintain water quality.

Groundwater quality has been monitored on a quarterly basis since 2012 at nine locations across the Jandakot Airport estate enabling consideration of more appropriate assessment levels based on prevailing conditions at the upgradient sites. This is particularly relevant for nutrients and electrical conductivity since none of the previously applied targets have considered the typical range of concentrations found in Swan Coastal Plain shallow aquifer groundwater systems.

Revised assessment levels have been adopted for Total Nitrogen, Total Phosphorous, pH, Electrical Conductivity, Aluminium, Cadmium, Zinc, Lead and Iron based on the 90<sup>th</sup> percentile of collected groundwater data at bores JAMB5, 6, 7, 8 & 9 which are all located upgradient of infrastructure and operations on the Jandakot Airport estate and may therefore be considered as 'observed control sites' consistent with the recommendations of ARMCANZ & ANZECC 2000.

Under Part 5 Division 1 of the Regulations, the airport-lessee company (i.e. JAH) may propose a substitute standard that is applicable to the site if the existing standard defined in a Schedule to the Regulations is inappropriate, thereby establishing a 'local standard'. Whilst JAH does not intend to formally establish a local standard in the immediate future (noting it is lengthy process and rarely undertaken), it will consider the possibility at a future time and determine, following liaison with DIRD, whether the process is warranted.

#### QA/QC

All monitoring is to be undertaken using the appropriate applicable field and laboratory QA/QC procedures (e.g. AS 5667). Analysis of samples should be completed by laboratories which hold National Association of Testing Authorities (NATA) accreditation for the particular parameters and methodologies needed.

#### Reporting

Monitoring results (field or laboratory) that indicate the potential presence of contamination (as determined by the professional consultants engaged to undertake the monitoring program) must be reported to JAH immediately (i.e. within 72 hours of results becoming available) so as necessary action can be agreed upon and implemented.

Where an exceedance of assessment level is reported, JAH will advise the DIRD Airport Environment Officer (AEO) within 14 days. The AEO (in consultation as necessary with JAH and

the consultant undertaking groundwater monitoring) will determine if the nature of contamination is of a level that requires further action or for other agencies to be notified prior to the distribution of the Annual Report.

Groundwater monitoring results will be maintained on an electronic database that will be updated by the professional consultants engaged to undertake the monitoring program. The updated electronic database will be provided to the JAH Environment Manager along with an interim GME report (summarising any exceedances or issues from the previous monitoring event) within 8 weeks of the sampling event. Note that an interim GME report is not warranted if the draft Annual Report, as detailed below, is provided to the JAH Environment Manager within 8 weeks of the final GME of the Financial Year.

Consultants undertaking the Annual Groundwater Monitoring Program will prepare an Annual Report, which details the results of monitoring undertaken as described within this plan. Annual Monitoring Report will contain the following:

- An Executive Summary.
- An Introduction.
- Methodology
- Results, including interpretation, tabular and graphical reporting of results, analysis of long term trends and comparison with any other relevant regional data that is available from the DoW and/or Water Corporation.
- Conclusions and Recommendations, including recommended changes to the sampling plan and/or assessment levels.
- QA/QC, including a validation of the analytical data by a critical review of all QA/QC processes.

The Annual Monitoring Report will be submitted by 28 October each year to DoE, DIRD, DoW and the Water Corporation.

#### **Amendment of Groundwater Sampling Program**

The bores sampled, sampling frequency and/or suite of analytes may be reviewed and amended from time to time when warranted.

Changes that increase the sampling frequency or suite of analytes may occur at any time based on the recommendation of the groundwater consultant engaged to undertake the groundwater monitoring program.

Any proposed changes in sampling frequency, suite of analytes or assessment levels as described in Table 1 will be proposed and justified within either a GME interim report or the Annual Groundwater Monitoring Report. Key stakeholders will be asked to comment on proposed changes prior to the changes being implemented.

#### **Auditing**

The Annual Groundwater Monitoring Reports are to be provided to key stakeholders and regulators annually, and comment and feedback is encouraged. This process allows for expert peer review, which may subsequently result in changes/improvements to the monitoring program.

Independent auditing of the groundwater monitoring program (including results and reports) will be undertaken every 5 years, with the next audit scheduled for 2017. The audit report will be provided to key stakeholders for review and comment, following which the Groundwater Monitoring Program will be reviewed and if necessary, amended.

**Table 4: Ground Water Assessment Levels.**

Parameter	Unit	A(EP)R 1997 Schedule 2	Adopted assessment Level
<b>On Site Field Measurements</b>			
Rainfall	mm	n/a	n/a
Depth to Groundwater Level	mtoc	n/a	n/a
Groundwater Level	mAHD	n/a	n/a
pH	Units	6.5-9.0	3.5-9.0
Temperature	°C	>2 above seasonal mean	>2 above seasonal mean
Electrical Conductivity (EC)	µS/cm	1,000	120-440
Dissolved Oxygen (DO)	%	>80	>80
	mg/L	>6	>6
<i>On site measurements are to be undertaken with appropriately calibrated equipment (certificates to be provided within AGMR)</i>			
<b>Laboratory Analysis</b>			
Electrical Conductivity (EC)	µS/cm	1,000	120-480
Total Dissolved Solids	mg/L	<1000 or 5% increase	<1000 or 5% increase
Total Acidity (as CaCO <sub>3</sub> )	mg/L	<40	60
Net Acidity (T <sub>acid</sub> -T <sub>alk</sub> as CaCO <sub>3</sub> )	mg/L	60	60
Chloride (Cl)	mg/L	250	250
Sulphate (SO <sub>4</sub> )	mg/L	500	500
Hardness (as CaCO <sub>3</sub> )	mg/L	n/a	n/a
<b>Nutrients</b>			
Phosphorus (P)	mg/L	0.01	0.12
Nitrogen (N)	mg/L	0.1	6.39
<b>Heavy Metals</b>			
Aluminium	mg/L	0.1	3.34
Arsenic	mg/L	0.05	0.05
Cadmium	mg/L	0.0002	0.0002
Chromium	mg/L	0.01	0.01
Copper	mg/L	0.002	0.003
Iron	mg/L	1	1.45
Lead	mg/L	0.001	0.003
Nickel	mg/L	0.015	0.015
Zinc	mg/L	0.005	0.019
<b>Total Petroleum Hydrocarbons</b>			
Fuel (C <sub>6</sub> -C <sub>9</sub> fractions)	mg/L	0.15	0.15
Mineral Oil (>C <sub>9</sub> fractions)	mg/L	0.6	0.6
<b>Monocyclic Aromatic Compounds</b>			
Benzene	mg/L	0.3	<0.001*
Toluene	mg/L	0.3	0.025*
Ethylbenzene	mg/L	0.14	0.003*
Xylene	mg/L	n/a	0.02*

\*values adopted from ADWG as requested by Department of Health

## 4.2 Delivery

Key tasks, roles and responsibilities relating to delivery of urban water management objectives are outlined in Table 5.

**Table 5: summary of roles and responsibilities**

Task	Responsibility	Timing
01 Implementation of the LWMS and GMP.	JAH	Ongoing
02 Development and implementation of Construction Environmental Management Plans (CEMPs), Demolition Environmental Management Plans and Operational Environmental Management Plans (OEMPs) to reduce the risk of pollution on tenant sites.	All relevant tenants and contractors, facilitated by JAH	Ongoing
03 Undertaking tenant audits and inspections.	JAH	Ongoing
04 Training and awareness programs (e.g. Site inductions, Tenant Environmental Handbook, spill response training, etc.).	JAH	Ongoing
05 Reporting of all spills greater than 2L and all spills that have the potential to result in environmental harm (regardless of volume).	All relevant tenants and contractors, facilitated by JAH	Ongoing
06 Environmental site assessment where the activities of the tenant are determined to have resulted in possible soil or groundwater contamination.	All relevant tenants and contractors, facilitated by JAH	Prior to expiry, transfer or termination of a tenant lease or licence,
07 Connection of new developments to reticulated sewerage.	JAH	Ongoing
08 Connection of existing buildings to reticulated sewerage by end of 2024 (excluding facilities where connection to reticulated sewerage is not feasible).	All relevant tenants, facilitated by JAH	Ongoing
09 Investigate Acid Sulfate Soils in line with DER guidelines and triggers.	Proponent, facilitated by JAH	Prior to any action that triggers a requirement for investigation.
10 Design and construction of lot scale drainage systems consistent with the LWMS.	Proponent, facilitated by JAH	Ongoing
11 Design and construction of lot scale landscaping and irrigation systems consistent with the LWMS.	Proponent, facilitated by JAH	Ongoing
12 Design and construction of precinct drainage systems consistent with the LWMS.	JAH	Ongoing
13 Provide an annual groundwater abstraction report, containing abstraction volumes obtained from monthly meter readings, to the DoW.	JAH EM	Annually, ongoing
14 Provide an annual groundwater monitoring report, containing abstraction volumes obtained from monthly meter readings, to DoE, DIRD, DoW and the Water Corporation.	JAH EM	Annually, ongoing

### 4.3 Review

This Local Water Management Strategy has been prepared in support of Jandakot Airport developments within the JUWPCA. The document should be revised and updated in future should development vary significantly from that proposed within Master Plan 2014 or the development of additional precincts be proposed.

## 5 REFERENCES AND RESOURCES

- AIC (2008). *Ethnographic and Archaeological Site Identification Survey Report Jandakot Airport Master Plan*. Report prepared for JAH by Australian Interaction Consultants, September 2008.
- ARMCANZ & ANZECC 2000, *Australian and New Zealand guidelines for fresh and marine water quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.
- Bureau of Meteorology 2011, <[www.bom.gov.au](http://www.bom.gov.au)>.
- Coffey Environments Australia Pty Ltd 2014. *2013-2014 Annual Groundwater Monitoring Report, Jandakot Airport*, WA. Unpublished report for Jandakot Airport Holdings
- CyMod Systems Pty Ltd 2009a. *Local Scale Groundwater Modelling of Jandakot Airport*. Unpublished report for Jandakot Airport Holdings
- CyMod Systems Pty Ltd 2009b. *Local Scale Groundwater Solute Transport Modelling of Jandakot Airport*. Unpublished report for Jandakot Airport Holdings
- Davidson (1995). *Hydrogeology and Groundwater Resources of the Perth Region Western Australia*; Bulletin 142, Geological Survey of Western Australia, Department of Minerals and Energy.
- Department of Environment (DoE) 2004a, *Perth Groundwater Atlas, Second Edition*, Perth.
- Department of Environment (DoE) 2004b, *Water Quality Protection Note: Land use compatibility in Public Drinking Water Source Areas* available at the Department of Water website, <http://www.water.wa.gov.au/PublicationStore/first/12441.pdf>
- Department of Environment and Conservation 2004c, *River restoration manual*, Perth.
- Department of Environment and Conservation 2008. *Swan Coastal Plain Geomorphic Wetlands Digital Dataset – 2008 update*.
- Department of Environment and Conservation 2011, *Treatment and management of soils and water in acid sulfate soil landscapes*, Perth.
- Department Environment and Conservation 2013. *Identification and investigation of acid sulfate soils and acidic landscapes*.
- Department of Water 2004–09, *Stormwater management manual for Western Australia*, Perth.
- Department of Water 2008a, *Interim: Developing a local water management strategy*, Perth.
- Department of Water 2008b, *Management area review of shallow groundwater systems on Gnangara and Jandakot mounds*, Perth.
- Department of Water 2009, *Decision process for stormwater management in Western Australia*, Perth.
- Department of Water 2010a, *Water recycling and efficiency note: community bores*, Perth.

- Department of Water 2010b, *Perth-Peel regional water plan 2010–2030: responding to our drying climate*, Perth.
- Department of Water 2010c, *Hydrogeochemical assessment of the Superficial aquifer – Perth metropolitan area*, Perth.
- Department of Water 2012, *Environmental management of groundwater from the Jandakot Mound - Triennial compliance report to the Office of the Environmental Protection Authority July 2008 to June 2011*, Perth.
- Department of Water 2014, *Environmental management of groundwater from the Gnangara and Jandakot mounds Annual compliance report to the Office of the Environmental Protection Authority July 2012 to June 2013*.
- Environmental Protection Authority (EPA) 1992, *Environmental protection (Swan coastal plain lakes) policy 1992*.
- Institute of Engineers Australia 2001, *Australian rainfall and runoff, a guide to flood estimation*.
- Institute of Engineers Australia 2006, *Australian runoff quality guidelines*.
- Jandakot Airport Holdings 2009a. Master Plan 2009.
- Jandakot Airport Holdings 2009b. Environment Strategy 2009.
- Jandakot Airport Holdings 2013. Landscape Design Guidelines.
- Jandakot Airport Holdings 2014a. Master Plan 2014.
- Jandakot Airport Holdings 2014b. Jandakot Airport Offset Plan V14.
- Pendragon 2013. Annual Groundwater Monitoring Report, Jandakot Airport. Unpublished report for Jandakot Airport Holdings
- Pilgrim, D.H. 1998. *Australian Rainfall and Runoff: A guide to flood estimation*. Barton, ACT
- VDM Consulting (2009). Jandakot Airport Local Water Management Strategy, Issue No. 2, October 2009.
- Water and Rivers Commission (WRC) 1997, *Perth Groundwater Atlas*, Perth.
- Western Australian Planning Commission 2003a. *Planning bulletin no. 64: acid sulfate soils*, Perth.
- Western Australian Planning Commission (WAPC) 2003. *Statement of Planning Policy No 2.3: Jandakot Ground Water Protection Policy*.
- Western Australian Planning Commission 2004, *Statement of planning policy no. 2.9: Water resources policy*, Perth.
- Western Australian Planning Commission 2008a, *Better urban water management*, Perth.
- Western Australian Planning Commission 2008b, *Liveable neighbourhoods edition 4*, Perth.
- Western Australian Planning Commission 2008c, *Planning bulletin no. 92, urban water management*, Perth.

## **APPENDIX 1: TABLES EXTRACTED FROM 2013-2014 ANNUAL GROUNDWATER MONITORING REPORT (COFFEY 2014)**

TABLE 1  
CURRENT AND HISTORICAL MONITORING RESULTS  
GROUNDWATER MONITORING BORES JAMB1-JAMB11  
2013/2014 GROUNDWATER MONITORING ANNUAL REPORT  
ENAUPT04378AA



			Field Measurements						Laboratory Measurements						Dissolved Metals (filtered)											
			Standing Water Levels	End of Hole	pH Value	Electrical Conductivity @ 25 °C	Dissolved Oxygen	Redox Potential (Eh)	pH Value (laboratory)	Electrical Conductivity @ 25 °C	Total Dissolved Solids @180 °C	Acidity as CaCO3 (TA)	Sulfate as SO4	Chloride as Cl	Aluminium	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Iron		
Unit			mbtoc	mbtoc	pH Unit	µS/cm	mg/L	mV		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/l	mg/L	mg/L	mg/L	mg/L			
LoR			-	-	0.01	1	0.1	1		1	5	1	1	1	0.05	0.001	0.0002	0.001	0.001	0.001	0.0001	0.001	0.001			
A(EP)R 1997 Schedule 2			-	-	6.5 - 9	1000	>6	-		1000	<1,000 or 5% increase	<40	500	250	0.1	0.05	0.0002	0.01	0.002	0.001	0.0001	0.015	0.005	1		
ADWG (2011)			-	-	6.0-8.5	-	-	-		-	<600	-	250	250	0.2	0.007	0.002	-	1	0.01	0.001	0.02	3	0.3		
ANZECC (2000) 95% Species Protection Guidelines			-	-	6.5-8.5	120-300	-	-		120-300	-	-	-	-	0.055	0.024	0.0002*	0.001*	0.0014*	0.0034*	0.06	0.011	0.008*	-		
Sample ID	Sample Job Number	Date																								
JAMB1	EP1202165	20/03/2012	5.700	9.000	5.11	279	4.11	-72	-	291	195	26	65	28	0.56	0.001	0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	0.27		
	EP1205007	21/06/2012	5.790	9.000	5.06	189	6.98	-68	-	-	-	-	-	-	0.79	<0.001	<0.0001	0.001	<0.001	<0.001	-	<0.001	0.016	0.37		
	EP1208113	28/09/2012	5.140	9.000	5.14	223	7.66	38	-	197	183	14	52	19	0.62	<0.001	<0.0001	0.001	<0.001	0.001	-	<0.001	<0.005	0.29		
	EP1210429	13/12/2012	5.250	9.000	5.16	90	7.71	-96	-	171	143	36	40	16	0.73	<0.001	<0.0001	<0.001	<0.001	0.001	-	<0.001	<0.005	0.18		
	EP1301954	19/03/2013	5.550	9.000	4.99	175	5.39	-46	-	170	113	38	36	16	0.94	<0.001	<0.0001	<0.001	<0.001	<0.001	-	0.001	<0.005	0.17		
	-	26/06/2013	5.320	9.000	5.16	298	3.57	164	-	135	134	42	27	14	1	<0.001	<0.0001	0.001	<0.001	0.001	-	<0.001	<0.005	0.21		
	141232	27/09/2013	4.410	9.090	5.07	202	0.31	73	-	370	240	42	78	23	0.88	<0.001	<0.0001	0.001	<0.001	0.002	0.00006	<0.001	0.003	0.13		
	403403-W	11/12/2013	4.624	9.013	4.99	324	0.43	269.8	5.2	300	210	55	12	29	0.84	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.0001	<0.001	0.005	0.21		
-	27/03/2014	5.025	9.085	4.95	270	0.25	844	6.5	200	160	55	9.2	30	0.65	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.0001	0.009	0.01	0.12			
JAMB2	EP1202165	20/03/2012	15.730	18.000	5.35	275	2.30	-3	-	266	176	21	53	25	0.24	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	0.09		
	EP1205007	21/06/2012	15.820	18.000	5.28	294	6.44	-43	-	-	-	-	-	-	0.82	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	0.08		
	EP1208113	28/09/2012	15.200	18.000	4.97	251	10.31	52	-	227	205	50	65	26	0.46	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	0.008	0.15		
	EP1210429	13/12/2012	15.050	18.000	5.38	110	7.30	151	-	220	155	11	47	24	0.45	<0.001	<0.0001	<0.001	0.001	<0.001	-	<0.001	<0.005	<0.05		
	EP1301954	19/03/2013	15.850	18.000	4.84	234	5.02	-11	-	213	130	68	44	25	0.48	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	0.08		
	-	26/06/2013	15.180	18.000	5.68	246	4.14	233	-	185	207	66	46	22	0.53	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	0.07		
	141232	27/09/2013	14.370	17.040	4.85	168	3.20	226	-	220	140	51	45	28	0.18	<0.001	<0.0001	<0.001	0.005	<0.001	<0.00005	<0.001	0.008	0.02		
	403403-W	11/12/2013	14.270	17.510	4.70	352	5.52	362.1	4.8	300	190	27	17	40	0.33	<0.001	<0.0002	<0.001	0.004	<0.001	<0.0001	<0.001	0.01	<0.05		
-	27/03/2014	14.715	17.005	4.66	191	1.34	151.4	5.6	160	130	37	8.7	22	0.41	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.0001	0.004	0.005	<0.05			
JAMB3	EP1202165	20/03/2012	22.930	26.000	5.90	231	6.66	138	-	258	165	11	18	27	0.28	<0.001	<0.0001	<0.001	0.002	<0.001	-	<0.001	0.022	0.10		
	EP1205007	21/06/2012	23.010	26.000	5.99	234	3.84	121	-	-	-	-	-	-	0.38	<0.001	<0.0001	0.001	<0.001	<0.001	-	<0.001	<0.005	0.17		
	EP1208113	28/09/2012	22.720	26.000	5.73	150	2.07	-31	-	127	115	28	14	27	0.47	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	0.007	0.2		
	EP1210429	13/12/2012	22.760	26.000	5.64	124	4.88	111	-	220	199	24	47	25	0.5	<0.001	<0.0001	<0.001	<0.001	0.001	-	<0.001	<0.005	<0.05		
	EP1301954	19/03/2013	-	26.000	5.18	304	4.78	-61	-	216	148	54	50	25	0.48	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	0.07		
	-	26/06/2013	22.890	26.000	5.45	267	3.11	99	-	192	168	53	47	23	0.54	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	0.08		
	141232	27/09/2013	22.212	26.590	4.93	194	3.11	238	-	200	130	9	22	49	0.25	<0.001	<0.0001	<0.001	0.002	<0.001	<0.00005	<0.001	0.011	0.14		
	403403-W	11/12/2013	21.986	26.823	4.62	188	2.88	243.5	5.8	140	98	12	< 5	31	0.21	<0.001	<0.0002	<0.001	0.004	<0.001	<0.0001	0.001	0.029	0.09		
JAMB3B	-	27/03/2014	10.133	12.420	4.95	670	6.93	172.5	6.3	560	310	10	5.7	180	0.17	<0.001	<0.0002	<0.001	0.001	<0.001	<0.0001	0.004	0.011	<0.05		
JAMB4	EP1202165	20/03/2012	6.230	9.000	4.81	228	3.18	-83	-	494	258	37	42	120	1.41	<0.001	<0.0001	<0.001	<0.001	<0.001	-	0.003	0.031	1.43		
	EP1205007	21/06/2012	6.290	9.000	4.78	333	2.77	-77	-	-	-	-	-	-	2.47	<0.001	<0.0001	0.002	<0.001	0.002	-	<0.001	<0.005	0.86		
	EP1208113	28/09/2012	5.780	9.000	4.76	310	2.91	-91	-	442	356	52	38	126	3.21	<0.001	<0.0001	0.002	<0.001	0.001	-	0.005	0.009	0.81		
	EP1210429	13/12/2012	5.850	9.000	4.38	220	4.05	-94	-	415	317	58	128	84	2.17	<0.001	<0.0001	0.001	<0.001	<0.001	-	0.002	<0.005	0.79		
	EP1301954	19/03/2013	-	9.000	4.34	491	3.16	-43	-	470	350	30	46	121	3.09	<0.001	<0.0001	0.002	<0.001	0.004	-	<0.001	<0.005	1.56		
	-	26/06/2013	-	9.000	4.49	491	3.91	-43.6	-	419	286	64	36	110	1.92	<0.001	<0.0001	0.002	<0.001	<0.001	-	0.002	0.007	0.94		
	141232	27/09/2013	5.190	9.045	4.28	427	2.95	130	-	430	270	46	56	100	2.7	<0.001	<0.0001	0.001	0.001	0.001	<0.00005	0.003	0.008	1.6		
	403250-W	10/12/2013	5.308	8.973	4.30	496	2.73	150.1	4.1	490	300	47	21	94	1.8	<0.001	<0.0002	<0.001	<0.001	0.001	<0.0001	0.003	0.008	1.3		
-	26/03/2014	5.745	9.045	4.12	452	0.33	-73.4	6.9	400	280	58	7	120	1.5	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.0001	0.011	0.002	1.5			
JAMB5	EP1202165	20/03/2012	3.720	6.000	4.78	287	2.87	-74	-	412	247	43	50	82	1.47	<0.001	<0.0001	<0.001	<0.001	<0.001	-	0.003	0.027	1.54		
	EP1205007	21/06/2012	3.800	6.000	4.81	291	3.01	-63	-	-	-	-	-	-	3.69	<0.001	<0.0001	<0.001	<0.001	0.003	-	<0.001	0.017	2.08		
	EP1208113	28/09/2012	2.910	6.000	4.85																					

TABLE 1  
CURRENT AND HISTORICAL MONITORING RESULTS  
GROUNDWATER MONITORING BORES JAMB1-JAMB11  
2013/2014 GROUNDWATER MONITORING ANNUAL REPORT  
ENAUPT04378AA



			Field Measurements						Laboratory Measurements						Dissolved Metals (filtered)										
			Standing Water Levels	End of Hole	pH Value	Electrical Conductivity @ 25 °C	Dissolved Oxygen	Redox Potential (Eh)	pH Value (laboratory)	Electrical Conductivity @ 25 °C	Total Dissolved Solids @180 °C	Acidity as CaCO3 (TA)	Sulfate as SO4	Chloride as Cl	Aluminium	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Iron	
Unit			mbtoc	mbtoc	pH Unit	µS/cm	mg/L	mV	pH Unit	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/l	mg/L	mg/L	mg/L	mg/L	
LoR			-	-	0.01	1	0.1	1	0.01	1	5	1	1	1	0.05	0.001	0.0002	0.001	0.001	0.001	0.0001	0.001	0.001	0.05	
A(EP)R 1997 Schedule 2			-	-	6.5 - 9	1000	>6	-	6.5 9	1000	<1,000 or 5% increase	<40	500	250	0.1	0.05	0.0002	0.01	0.002	0.001	0.0001	0.015	0.005	1	
ADWG (2011)			-	-	6.0-8.5	-	-	-	6.0 - 8.5	-	<600	-	250	250	0.2	0.007	0.002	-	1	0.01	0.001	0.02	3	0.3	
ANZECC (2000) 95% Species Protection Guidelines			-	-	6.5-8.5	120-300	-	-	6.5 - 8.5	120-300	-	-	-	-	0.055	0.024	0.0002*	0.001*	0.0014*	0.0034*	0.06	0.011	0.008*	-	
Sample ID	Sample Job Number	Date																							
JAMB6	EP1202165	20/03/2012	8.020	9.000	5.51	415	6.07	140	-	258	151	23	20	47	0.48	0.001	<0.0001	0.002	0.001	<0.001	-	<0.001	0.008	<0.05	
	EP1205007	21/06/2012	8.160	9.000	5.47	446	4.71	111	-	-	-	-	-	-	0.62	<0.001	<0.0001	0.002	<0.001	<0.001	-	<0.001	<0.005	<0.05	
	EP1208113	28/09/2012	7.500	9.000	5.49	433	5.45	86	-	213	182	23	24	40	0.44	<0.001	<0.0001	<0.001	0.003	<0.001	-	<0.001	0.007	<0.05	
	EP1210429	13/12/2012	6.720	9.000	5.37	130	5.73	133	-	264	217	17	22	38	0.42	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.05	
	EP1301954	19/03/2013	-	9.000	5.25	305	4.82	168	-	304	212	29	26	48	0.52	<0.001	<0.0001	0.001	<0.001	<0.001	-	<0.001	<0.005	<0.05	
	-	26/06/2013	7.850	9.000	5.15	321	2.07	26	-	266	215	45	22	46	0.47	<0.001	<0.0001	0.001	0.001	<0.001	-	<0.001	<0.005	<0.05	
	141232	27/09/2013	7.110	9.055	6.08	289	4.82	168	-	280	180	15	16	50	0.15	<0.001	<0.0001	<0.001	0.001	<0.001	<0.00005	<0.001	0.003	<0.01	
	403250-W	10/12/2013	7.113	9.059	5.92	255	5.09	327.3	6.0	220	170	14	< 5	36	0.13	< 0.001	< 0.0002	< 0.001	0.001	< 0.001	< 0.0001	0.002	0.005	< 0.05	
-	26/03/2014	7.595	9.055	5.38	570	4.63	153.8	6.6	520	360	27	9.2	110	0.52	<0.001	<0.0002	<0.001	0.002	<0.001	<0.0001	0.003	<0.001	<0.05		
JAMB7	EP1202165	20/03/2012	3.920	6.500	4.48	304	2.05	-65	-	490	308	36	64	96	1.25	<0.001	<0.0001	0.002	<0.001	0.003	-	<0.001	<0.005	0.24	
	EP1205007	21/06/2012	4.060	6.500	4.39	287	1.89	-57	-	-	-	-	-	-	1.01	<0.001	<0.0001	0.001	<0.001	<0.001	-	0.002	0.007	0.27	
	EP1208113	28/09/2012	3.340	6.500	4.36	318	1.94	-71	-	549	393	55	66	130	1.53	<0.001	<0.0001	0.001	<0.001	0.002	-	<0.001	0.008	0.25	
	EP1210429	13/12/2012	3.510	6.500	4.72	400	4.11	-18	-	752	520	39	69	181	1.32	<0.001	<0.0001	0.002	0.001	0.002	-	0.002	0.010	0.48	
	EP1301954	19/03/2013	-	6.500	4.38	444	3.20	-27	-	430	322	54	45	106	0.84	<0.001	<0.0001	<0.001	<0.001	<0.001	-	0.001	<0.005	0.21	
	-	26/06/2013	3.850	6.500	4.30	537	3.19	37	-	459	348	60	62	104	0.52	<0.001	<0.0001	<0.001	<0.001	0.001	-	<0.001	<0.005	0.24	
	141232	27/09/2013	2.940	6.055	3.86	401	0.70	77	-	410	260	53	48	97	1.8	<0.001	<0.0001	0.001	0.006	0.002	0.00006	<0.001	0.007	0.18	
	403250-W	10/12/2013	3.135	6.954	4.65	424	0.90	51.8	4.4	400	330	51	10	96	0.7	< 0.001	< 0.0002	< 0.001	0.006	0.001	< 0.0001	0.002	0.007	0.16	
-	26/03/2014	3.605	6.045	4.22	469	0.81	-45.0	4.5	440	360	78	12	100	1.3	<0.001	<0.0002	<0.001	<0.001	0.002	<0.0001	0.001	0.004	0.18		
JAMB8	EP1202165	20/03/2012	4.790	7.000	3.65	359	4.91	124	-	348	245	34	65	31	0.42	<0.001	<0.0001	<0.001	<0.001	0.002	-	<0.001	0.008	0.13	
	EP1205007	21/06/2012	4.810	7.000	3.55	369	5.37	98	-	-	-	-	-	-	0.4	<0.001	<0.0001	<0.001	0.001	<0.001	-	0.004	<0.005	0.10	
	EP1208113	28/09/2012	4.490	7.000	3.61	361	5.23	111	-	239	157	57	32	34	0.52	<0.001	<0.0001	<0.001	<0.001	0.004	-	<0.001	0.022	<0.05	
	EP1210429	13/12/2012	4.650	7.000	3.40	120	5.37	108	-	228	185	41	28	31	0.6	<0.001	<0.0001	<0.001	0.001	0.005	-	<0.001	0.005	0.16	
	EP1301954	19/03/2013	4.980	7.000	3.57	284	3.55	69	-	270	185	32	39	33	0.33	<0.001	<0.0001	<0.001	<0.001	<0.001	-	0.002	<0.005	0.06	
	-	26/06/2013	4.990	7.000	3.69	315	4.03	215	-	282	166	60	35	36	0.34	<0.001	<0.0001	<0.001	0.001	0.002	-	<0.001	0.005	0.08	
	141232	27/09/2013	3.925	7.295	3.33	257	1.95	371	-	260	160	50	38	26	0.97	<0.001	<0.0001	0.001	0.007	0.002	0.00006	0.002	0.14	0.07	
	403250-W	10/12/2013	4.113	7.216	3.54	286	0.72	379.9	3.4	280	140	50	8	32	0.36	< 0.001	< 0.0002	< 0.001	0.008	0.002	< 0.0001	0.004	0.005	< 0.05	
-	26/03/2014	4.185	7.290	3.47	290	0.62	81.7	3.6	200	140	52	7	35	0.4	<0.001	<0.0002	<0.001	0.004	0.003	<0.0001	0.011	0.002	0.07		
JAMB9	EP1202165	20/03/2012	4.400	7.000	5.16	209	2.79	186	-	-	-	-	-	-	0.17	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.05	
	EP1205007	21/06/2012	4.530	7.000	5.07	213	3.24	206	-	-	-	-	-	-	0.24	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.05	
	EP1208113	28/09/2012	4.000	7.000	5.11	212	2.98	194	-	320	188	38	69	29	0.23	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.05	
	EP1210429	13/12/2012	4.190	7.000	5.11	110	7.02	109	-	210	178	19	33	39	0.18	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	0.006	0.11	
	EP1301954	19/03/2013	4.600	7.000	4.88	245	3.29	250	-	226	152	27	37	39	0.21	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.05	
	-	26/06/2013	5.490	7.000	5.49	344	2.22	303	-	231	153	34	39	32	0.2	<0.001	<0.0001	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.05	
	141232	27/09/2013	3.405	7.200	4.65	258	1.04	329	-	260	170	27	41	50	0.22	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.00005	<0.001	0.002	<0.01	
	403250-W	10/12/2013	3.642	7.217	4.81	197	0.96	418.4	4.9	170	110	28	13	23	0.12	< 0.001	< 0.0002	< 0.001	0.001	< 0.001	< 0.0001	< 0.001	0.004	< 0.05	
-	26/03/2014	4.185	7.200	4.43	292	7.32	238.3	5.2	250	170	29	7.5	50	0.16	<0.001	<0.0002	<0.001	0.003	<0.001	<0.0001	0.012	0.011	<0.05		
JAMB10	403250-W	10/12/2013	4.397	6.975	4.32	135	0.32	260.6	4.1	110	140	73	<5	23	0.9	< 0.001	< 0.0002	< 0.001	0.007	< 0.001	< 0.0001	0.002	0.002	0.8	
-	27/03/2014	4.835	7.005	3.77	251	0.34	114.2	4.4	220	210	77	5.4	39	1.6	<0.001	<0.0002	<0.001	0.001	0.002	<0.0001	0.009	0.006	0.06		
JAMB11	403250-W	10/12/2013	4.482	7.092	4.38	136	4.39	450.2	4.1	110	120	34	5.6	20	0.85	< 0.001	< 0.0002	0.002	0.006	0.001	< 0.0001	0.002	0.004	0.08	
-	27/03/2014	5.295	7.170	3.93	162	1.80	177.1	6.2	120	140	65	<5	24	0.88	<0.001	<0.0002	0.002	0.002	0.002	<0.0001	0.008	0.007	0.07		

Notes:

JAMB = Jandakot Airport Groundwater Monitoring Bore

RPD = Relative Percentage Difference

# = Both constituent analyte concentrations are below LOR or have not been analysed.

.\* = Analysis not requested

LOR = Limit of Reporting (= Method Detection Limit)

NE = Guideline not established

QC = Quality Control

\* = LOR Exceeds criteria

1	Values displayed in <b>bold</b> indicate values reported above Laboratory LOR
1	Values highlighted indicate exceedances of A(EP)R (1997) Schedule 2
1	Values highlighted indicate exceedances of ADWG (2011)
1	Values highlighted indicate exceedances of ANZECC (2000) 95% Species Protection

Investigation Levels

Australian Environmental Protection Regulations (1997) Schedule 2

NHMRC & ARMCANZ (2011) *Australian Drinking Water Guidelines: Aesthetic*

ANZECC & ARMCANZ (2000) 95% Species Protection: Fresh Water</

TABLE 1  
CURRENT AND HISTORICAL MONITORING RESULTS  
GROUNDWATER MONITORING BORES JAMB1-JAMB11  
2013/2014 GROUNDWATER MONITORING ANNUAL REPORT  
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			Nutrients					Monocyclic Aromatic Hydrocarbons: BTEXN							Total Petroleum Hydrocarbons: TPH					Total Recoverable Hydrocarbons: TRH (NEPM 2010 Draft)						
			Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P	Total Phosphate as P	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	C6 - C10 Fraction minus BTEX (F1)	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	
Unit			mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
LoR			0.01	0.1	0.1	0.01	0.05	1	2	2	2	2	2	5	20	50	100	50	-	20	20	100	100	100	100	
A(EP)R 1997 Schedule 2			-	-	0.1	0.01		300	300	140	-	-	-	-	150	600	600	600	600	150	600	600	600	600	600	
ADWG (2011)			-	-	-	-	-	1	800	300	20	20	20	-	-	-	-	-	-	-	-	-	-	-	-	
ANZECC (2000) 95% Species Protection Guidelines			-	-	1.2	0.065	-	95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sample ID	Sample Job Number	Date																								
JAMB1	EP1202165	20/03/2012	2.48	<0.5	2.5	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	-	-	-	-	<20	<20	-	-	-	-	
	EP1205007	21/06/2012	1.5	1.8	3.3	0.12	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1208113	28/09/2012	1.2	1	2.2	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1210429	13/12/2012	3.38	2	5.4	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1301954	19/03/2013	2.12	1	3.1	0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	-	26/06/2013	2.06	1	3.1	<0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	141232	27/09/2013	-	-	6.0	<0.05*	-	<1	<1	<1	<2	<1	-	<1	<10	<50	<100	<100	-	<10	<01	<50	<50	<100	<100	
	403403-W	11/12/2013	8.8	1.5	10	-	<0.05	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<50	<50	<20	<20	<50	<100	<100	<100	
JAMB2	-	27/03/2014	7	2.4	9.4	<0.05*	-	<1	<1	<1	<2	<1	<3	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
	EP1202165	20/03/2012	3.84	0.9	4.7	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	-	-	-	-	<20	<20	-	-	-	-	
	EP1205007	21/06/2012	4.41	1.1	5.5	0.05	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1208113	28/09/2012	0.61	0.7	1.3	<0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1210429	13/12/2012	4.57	1	5.6	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1301954	19/03/2013	2.45	0.9	3.4	0.06	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	-	26/06/2013	1.48	0.8	2.3	0.03	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	141232	27/09/2013	-	-	3.7	0.14	-	<1	<1	<1	<2	<1	-	<1	<10	<50	<100	<100	-	<10	<10	<50	<50	<100	<100	
JAMB3	403403-W	11/12/2013	5.1	0.9	6	-	<0.05	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
	-	27/03/2014	4.37	1.7	6.1	0.09	-	<1	<1	<1	<2	<1	<3	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
	EP1202165	20/03/2012	1.38	<0.5	1.4	<0.05*	-	<1	5	<2	<2	<2	<2	<5	<20	-	-	-	-	<20	<20	-	-	-	-	
	EP1205007	21/06/2012	0.27	0.3	0.6	0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	520	300	820	<20	<20	<100	540	190	730	
	EP1208113	28/09/2012	1.18	1.1	2.3	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1210429	13/12/2012	4.63	0.6	5.2	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1301954	19/03/2013	2.46	1	3.5	0.13	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	-	26/06/2013	1.63	0.9	2.5	0.08	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
JAMB3B	141232	27/09/2013	-	-	1.0	<0.05*	-	<1	<1	<1	<2	<1	<1	<10	<50	<100	<100	-	<10	<10	<50	<50	<100	<100	<100	
	403403-W	11/12/2013	0.16	< 0.2	< 0.2	-	<0.05	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
	-	27/03/2014	1.9	1.3	3.2	<0.05*	-	<1	<1	<1	<2	<1	<3	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
	EP1202165	20/03/2012	0.04	0.2	0.2	<0.01	-	<1	10	<2	<2	<2	<2	<5	<20	-	-	-	-	<20	<20	-	-	-	-	
	EP1205007	21/06/2012	2.4	0.6	3.0	0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1208113	28/09/2012	0.06	1.2	1.3	0.17	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1210429	13/12/2012	1.22	0.8	2.0	<0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1301954	19/03/2013	0.09	0.7	0.8	0.02	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
JAMB4	-	26/06/2013	0.01	0.7	0.7	<0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	141232	27/09/2013	-	-	4.2	<0.05*	-	<1	<1	<1	<2	<1	-	<1	<10	<50	<100	<100	-	<10	<10	<50	<50	<100	<100	
	403250-W	10/12/2013	2.3	< 0.2	2.3	-	<0.05	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
	-	26/03/2014	<0.02	0.8	0.8	0.34	-	<1	<1	<1	<2	<1	<3	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
	EP1202165	20/03/2012	0.04	0.2	0.2	<0.01	-	<1	10	<2	<2	<2	<2	<5	<20	-	-	-	-	<20	<20	-	-	-	-	
	EP1205007	21/06/2012	<0.01	0.2	0.2	<0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1208113	28/09/2012	0.12	0.5	0.6	0.02	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	
	EP1210429	13/12/2012	0.06	0.3	0.4																					

TABLE 1  
CURRENT AND HISTORICAL MONITORING RESULTS  
GROUNDWATER MONITORING BORES JAMB1-JAMB11  
2013/2014 GROUNDWATER MONITORING ANNUAL REPORT  
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			Nutrients					Monocyclic Aromatic Hydrocarbons: BTEXN							Total Petroleum Hydrocarbons: TPH					Total Recoverable Hydrocarbons: TRH (NEPM 2010 Draft)					
			Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P	Total Phosphate as P	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	C6 - C10 Fraction minus BTEX (F1)	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)
Unit			mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LoR			0.01	0.1	0.1	0.01	0.05	1	2	2	2	2	2	5	20	50	100	50	-	20	20	100	100	100	100
A(EP)R 1997 Schedule 2			-	-	0.1	0.01		300	300	140	-	-	-	-	150	600	600	600	600	150	600	600	600	600	600
ADWG (2011)			-	-	-	-	-	1	800	300	20	20	20	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC (2000) 95% Species Protection Guidelines			-	-	1.2	0.065	(0.04 as FRP)	95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sample ID	Sample Job Number	Date																							
JAMB6	EP1202165	20/03/2012	4.69	0.6	5.3	0.12	-	<1	<2	<2	<2	<2	<2	<5	<20	-	-	-	-	<20	<20	-	-	-	-
	EP1205007	21/06/2012	<0.01	1.3	1.3	0.11	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	160	140	300	<20	<20	<100	250	160	410
	EP1208113	28/09/2012	0.24	1.1	1.3	0.03	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	EP1210429	13/12/2012	7.22	1	8.2	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	EP1301954	19/03/2013	7.55	4	11.6	0.14	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	-	26/06/2013	6.7	1.4	8.1	0.1	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	141232	27/09/2013	-	-	8.3	0.05	-	<1	<1	<1	<2	<1	-	<1	<10	<50	<100	<100	-	<10	<01	<50	<50	<100	<100
	403250-W	10/12/2013	4.9	< 0.2	4.9	-	<0.05	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100
-	26/03/2014	13	1.5	15	0.1	-	<1	<1	<1	<2	<1	<3	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
JAMB7	EP1202165	20/03/2012	<0.01	1.7	1.7	0.04	-	<1	<2	<2	<2	<2	<2	<5	<20	-	-	-	-	<20	<20	-	-	-	-
	EP1205007	21/06/2012	2.4	1.4	3.8	0.04	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	EP1208113	28/09/2012	3.72	2.2	5.9	0.11	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	EP1210429	13/12/2012	<0.01	1.1	1.1	0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	EP1301954	19/03/2013	<0.01	1.4	1.4	0.04	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	-	26/06/2013	<0.01	1.4	1.4	0.04	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
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	403250-W	10/12/2013	<0.05	1.6	1.6	-	<0.1	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100
-	26/03/2014	<0.02	1.8	1.8	0.08	-	<1	<1	<1	<2	<1	<3	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
JAMB8	EP1202165	20/03/2012	4.17	<0.5	4.2	<0.05	-	<1	<2	<2	<2	<2	<2	<5	<20	-	-	-	-	<20	<20	-	-	-	-
	EP1205007	21/06/2012	2.56	1.4	4.0	<0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	EP1208113	28/09/2012	2.84	1.2	4.0	0.12	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	EP1210429	13/12/2012	2.06	1.2	3.3	0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	EP1301954	19/03/2013	3.72	2.5	6.2	0.31	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	-	26/06/2013	4.12	1.3	5.4	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	141232	27/09/2013	-	-	4.8	<0.05*	-	<1	<1	<1	<2	<1	-	<1	<10	<50	<100	<100	-	<10	<01	<50	<50	<100	<100
	403250-W	10/12/2013	4.9	0.5	5.4	-	<0.05	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100
-	26/03/2014	4.6	1.2	5.8	0.19	-	<1	<1	<1	<2	<1	<3	<20	<20	<50	100	<100	100	<20	<20	<50	100	<100	100	
JAMB9	EP1202165	20/03/2012	4.39	<0.5	4.4	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	-	-	-	-	<20	<20	-	-	-	-
	EP1205007	21/06/2012	3.18	0.6	3.8	<0.01	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	340	250	590	<20	<20	<100	390	140	530
	EP1208113	28/09/2012	2.89	1.2	4.1	<0.010	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	EP1210429	13/12/2012	2.74	0.8	3.5	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
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	-	26/06/2013	4.19	0.9	5.1	<0.05*	-	<1	<2	<2	<2	<2	<2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	141232	27/09/2013	-	-	5.0	<0.05*	-	<1	<1	<1	<2	<1	-	<1	<10	<50	<100	<100	-	<10	<01	<50	<50	<100	<100
	403250-W	10/12/2013	1.2	< 0.2	1.2	-	<0.05	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100
-	26/03/2014	1.9	0.3	5.1	<0.05*	-	<1	<1	<1	<2	<1	<3	<20	<20	<50	<100	<100	<100	<20	<20	<50	<100	<100	<100	
JAMB10	403250-W	10/12/2013	2.5	1.6	4.1	-	<0.25	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	-	27/03/2014	3.53	3.4	7	<0.05*	-	<4	<4	<4	<8	<4	<12	<20	<80	<50	<100	<100	<100	<80	<80	<50	<100	<100	<100
JAMB11	403250-W	10/12/2013	1.2	<0.2	1.2	-	<0.05	<1	<1	<1	<2	<1	<1	<20	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100
	-	27/03/2014	0.44	2.1	2.6	0.06	-	<4	<4	<4	<8	<4	<12	<20	<80	<50	<100	<100	<100	<80	<80	<50	<100	<100	<100

Notes:

JAMB = Jandakot Airport Groundwater Monitoring Bore

RPD = Relative Percentage Difference

# = Both constituent analyte concentrations are below LOR or have not been analysed.

‘-’ = Analysis not requested

LOR = Limit of Reporting (= Method Detection Limit)

NE = Guideline not established

QC = Quality Control

\* = LOR Exceeds criteria

1	Values displayed in <b>bold</b> indicate values reported above Laboratory LOR
1	Values highlighted indicate exceedances of A(EP)R (1997) Schedule 2
1	Values highlighted indicate exceedances of ADWG (2011)
1	Values highlighted indicate exceedances of ANZECC (2000) 95% Species Protection

Investigation Levels

Australian Environmental Protection Regulations (1997) Schedule 2

NHMRC & ARMCANZ (2011) *Australian Drinking Water Guidelines: Aesthetic*

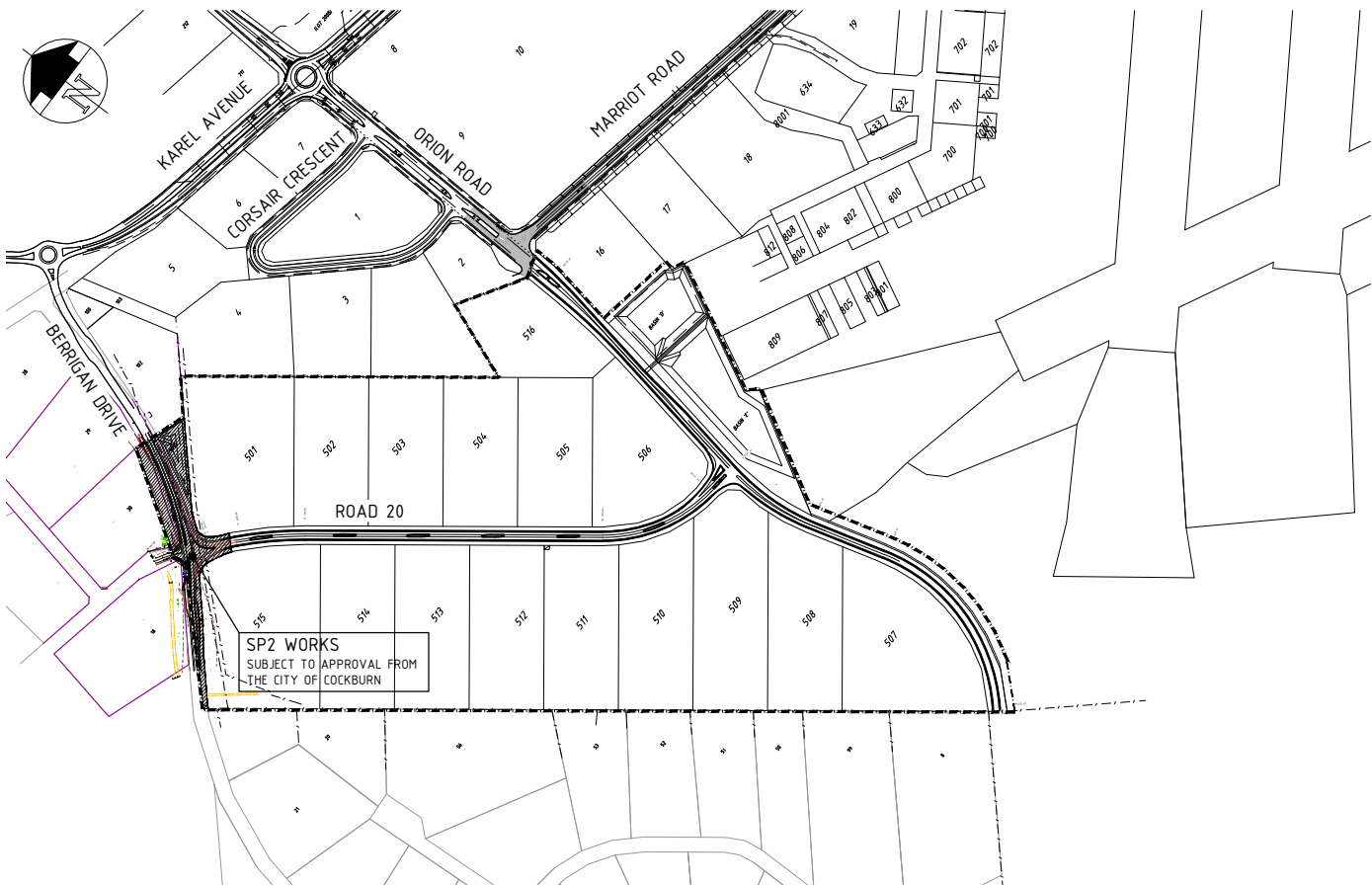
ANZECC & ARMCANZ (2000) 95% Species Protection: Fresh Water

## APPENDIX 2: ENGINEERING DESIGNS

# JANDAKOT AIRPORT REDEVELOPMENT

## PRECINCT 5

### DRAWING INDEX, SITE PLAN & LOCALITY PLAN

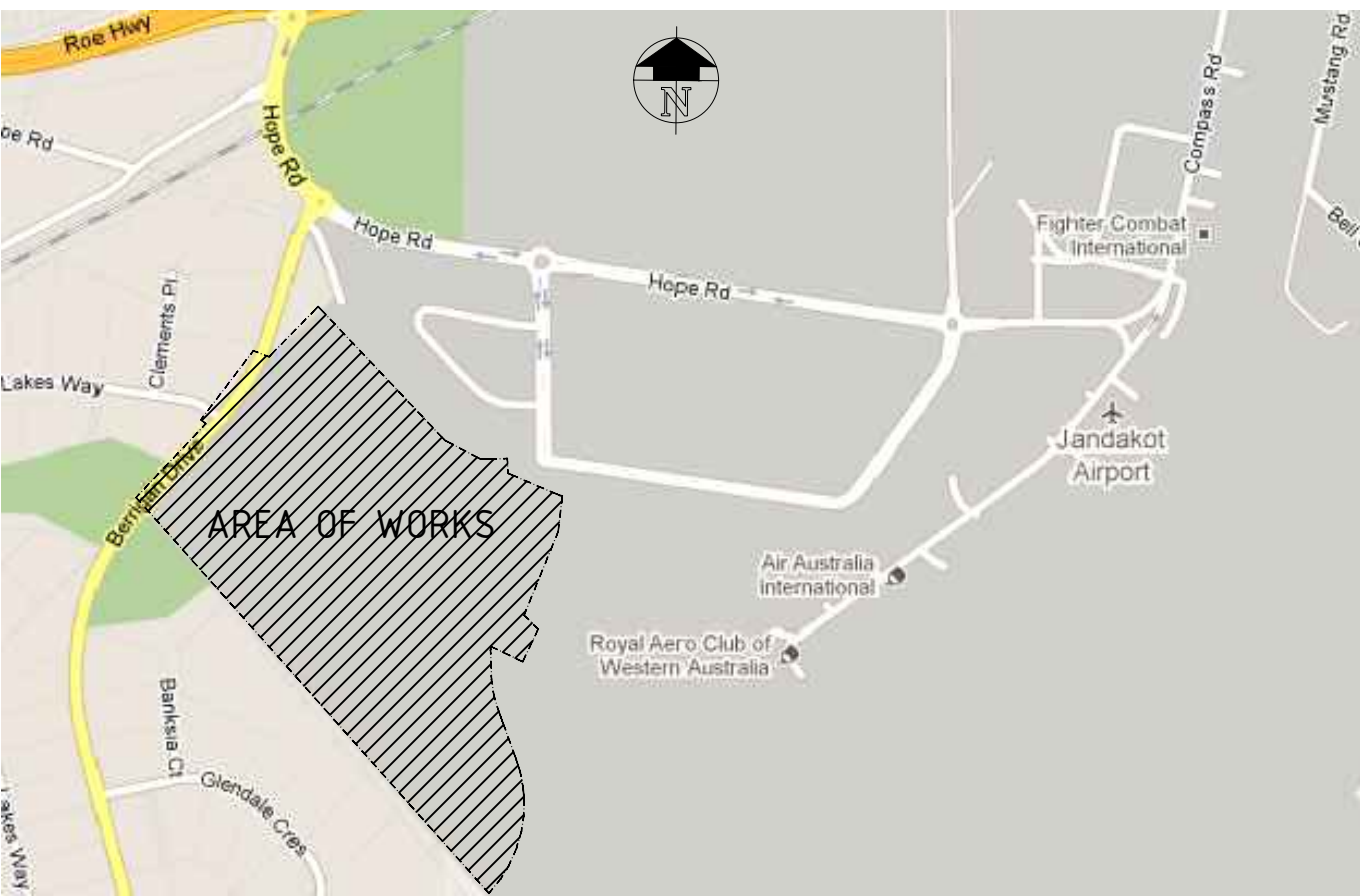


SITE PLAN  
1:5000

DRAWING LIST

DRAWING No.	TITLE
05-C-001	SITE PLAN, LOCALITY PLAN & DRAWING INDEX
05-C-010	GENERAL ARRANGEMENT
05-C-100	PLAN & PROFILE ORION ROAD CH. 0 TO CH. 500
05-C-101	PLAN & PROFILE ORION ROAD CH. 500 TO END
05-C-102	PLAN & PROFILE ROAD 20 CH. 0 TO CH. 400
05-C-103	PLAN & PROFILE ROAD 20 CH. 400 TO END
05-C-200	ROAD LAYOUT PLAN, ORION ROAD - SHEET 1
05-C-201	ROAD LAYOUT PLAN, ORION ROAD - SHEET 2
05-C-202	ROAD LAYOUT PLAN, ORION ROAD - SHEET 3
05-C-203	ROAD LAYOUT PLAN, ORION ROAD - SHEET 4
05-C-204	ROAD LAYOUT PLAN, ROAD 20 - SHEET 1
05-C-205	ROAD LAYOUT PLAN, ROAD 20 - SHEET 2
05-C-206	ROAD LAYOUT PLAN, ROAD 20/BERRIGAN DRIVE - SHEET 1
05-C-300	TYPICAL CROSS SECTIONS
05-C-310	TYPICAL SECTIONS KERB PROFILES
05-C-320	FENCING LAYOUT
05-C-321	TYPICAL FENCING DETAIL - SHEET 1 OF 2
05-C-322	TYPICAL FENCING DETAIL - SHEET 2 OF 2
05-C-400	LINEMARKING AND SIGNAGE - SHEET 1 OF 4
05-C-401	LINEMARKING AND SIGNAGE - SHEET 2 OF 4
05-C-402	LINEMARKING AND SIGNAGE - SHEET 3 OF 4
05-C-403	LINEMARKING AND SIGNAGE - SHEET 4 OF 4
05-C-410	LINEMARKING AND SIGNAGE

DRAWING No.	TITLE
05-C-500	DRAINAGE PLAN - SHEET 1 OF 4
05-C-501	DRAINAGE PLAN - SHEET 2 OF 4
05-C-502	DRAINAGE PLAN - SHEET 3 OF 4
05-C-503	DRAINAGE PLAN - SHEET 4 OF 4
05-C-504	DRAINAGE BASIN PLAN, ORION ROAD
05-C-505	DRAINAGE BASIN SECTIONS AND DETAILS - SHEET 1 OF 2
05-C-506	DRAINAGE BASIN PLAN, BERRIGAN DRIVE
05-C-507	DRAINAGE CATCHMENT PLAN
05-C-508	DRAINAGE BASIN SECTIONS AND DETAILS - SHEET 2 OF 2
05-C-510	DRAINAGE SCHEDULE
05-C-600	SEWER RETICULATION SITE PLAN
05-C-601	SEWER RETICULATION DESIGN DATA PLAN
05-C-602	SEWER RETICULATION - SHEET 1 OF 2
05-C-603	SEWER RETICULATION - SHEET 2 OF 2
05-C-610	WATER RETICULATION - SHEET 1 OF 2
05-C-611	WATER RETICULATION - SHEET 2 OF 2
05-C-620	W-POWER FIBRE OPTIC PROPOSED RELOCATION
05-C-622	SPARE COMMS RETICULATION
05-C-623	TELSTRA RETICULATION
05-C-630	GAS RETICULATION PLAN. PLAN LAYOUT DETAILS
05-C-631	TELSTRA PIT RELOCATION PLAN LAYOUT

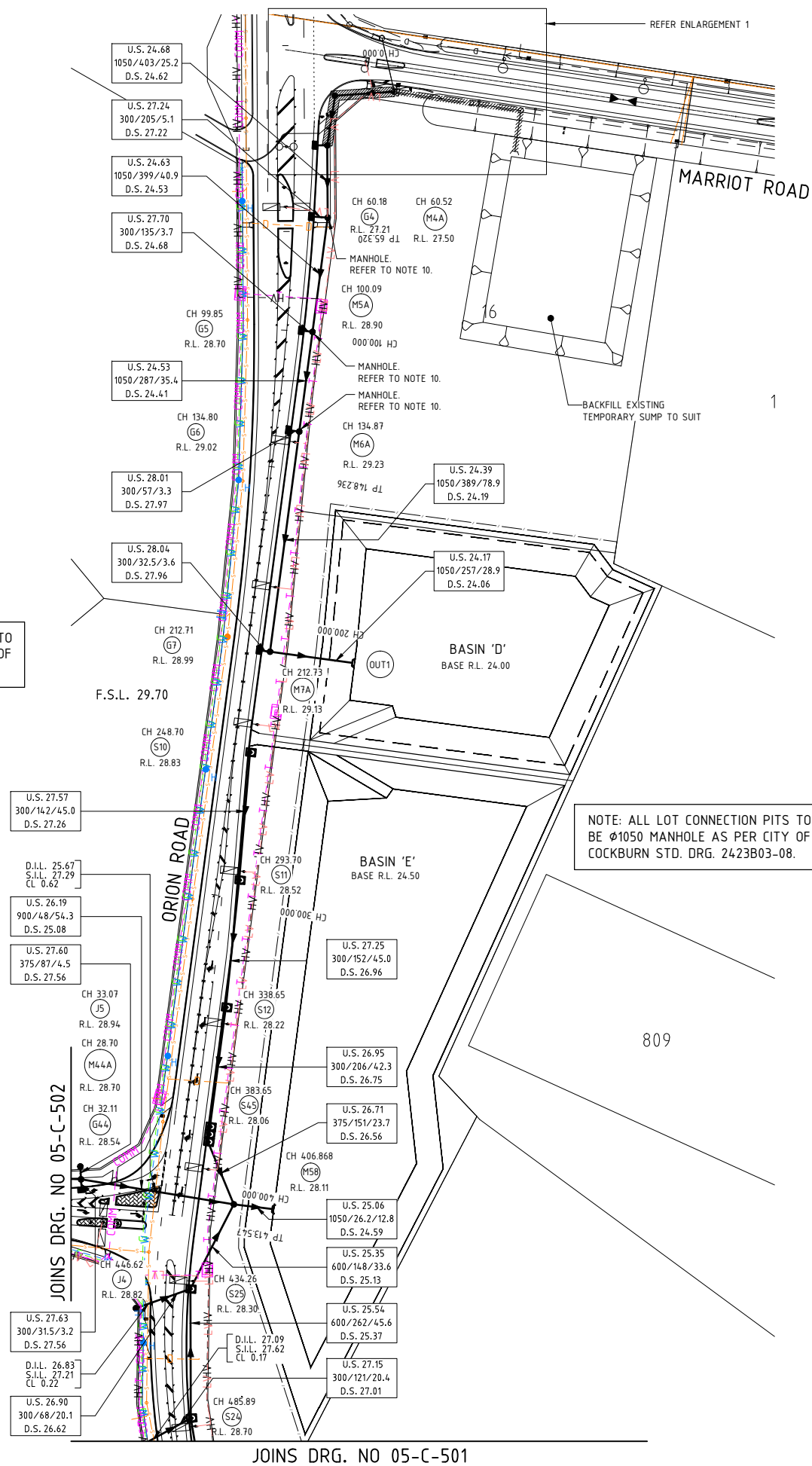


LOCALITY PLAN  
N.T.S.

DRAWING No.	TITLE
05-C-701	PAVEMENT PLAN - SHEET 1
05-C-702	PAVEMENT PLAN - SHEET 2
05-C-703	PAVEMENT PLAN - SHEET 3
05-C-800	EARTHWORKS PLAN - SHEET 1 OF 4
05-C-801	EARTHWORKS PLAN - SHEET 2 OF 4
05-C-802	EARTHWORKS PLAN - SHEET 3 OF 4
05-C-803	EARTHWORKS PLAN - SHEET 4 OF 4
05-C-810	CONTRACTORS SITE AREA SITE PLAN
05-C-900	ORION ROAD CROSS SECTIONS - SHEET 1 OF 7
05-C-901	ORION ROAD CROSS SECTIONS - SHEET 2 OF 7
05-C-902	ORION ROAD CROSS SECTIONS - SHEET 3 OF 7
05-C-903	ORION ROAD CROSS SECTIONS - SHEET 4 OF 7
05-C-904	ORION ROAD CROSS SECTIONS - SHEET 5 OF 7
05-C-905	ORION ROAD CROSS SECTIONS - SHEET 6 OF 7
05-C-906	ORION ROAD CROSS SECTIONS - SHEET 7 OF 7
05-C-907	ROAD 20 CROSS SECTIONS - SHEET 1 OF 8
05-C-908	ROAD 20 CROSS SECTIONS - SHEET 2 OF 8
05-C-909	ROAD 20 CROSS SECTIONS - SHEET 3 OF 8
05-C-910	ROAD 20 CROSS SECTIONS - SHEET 4 OF 8
05-C-911	ROAD 20 CROSS SECTIONS - SHEET 5 OF 8
05-C-912	ROAD 20 CROSS SECTIONS - SHEET 6 OF 8
05-C-913	ROAD 20 CROSS SECTIONS - SHEET 7 OF 8
05-C-914	ROAD 20 CROSS SECTIONS - SHEET 8 OF 8
05-C-915	BERRIGAN DRIVE CROSS SECTIONS - SHEET 1 OF 2
05-C-916	BERRIGAN DRIVE CROSS SECTIONS - SHEET 2 OF 2

DRAWING No.	TITLE
E-01	SITE PLAN AND DETAILS
E-02	STREET LIGHTING
E-03	INFRASTRUCTURE LAYOUT
E-04	HV SINGLE LINE DIAGRAM
AS CONSTRUCTED DRAWING LIST	
(FROM PREVIOUS STAGE OF WORK)	
94522AS-070A	WATER RETICULATION PLAN
94522AS-126A	FIRE RING RETICULATION PLAN
JCE06061-E01	HV/LV CONDUIT LAYOUT
JCE06061-E03	STREET LIGHTING LAYOUT
JCE06061-E08	BLOWN FIBER CONDUITING LAYOUT
2880-8/31	SEWER RETICULATION PLAN - SHEET 2
2880-8/32	SEWER RETICULATION PLAN - SHEET 3
CW4-95376111-212387-00002_3	SERVICE EASEMENT PLAN

<table><tr><td>2</td><td>12.09.2013</td><td>AS CONSTRUCTED</td><td>DP</td></tr><tr><td>1</td><td>25.02.2013</td><td>ISSUED FOR CONSTRUCTION: SHEET 05-C-508 ADDED</td><td>AP</td></tr><tr><td>0</td><td>26.03.2012</td><td>ISSUED FOR CONSTRUCTION</td><td>AP</td></tr><tr><td>C</td><td>22.11.2011</td><td>ISSUED FOR TENDER</td><td>AP</td></tr><tr><td>B</td><td>11.11.2011</td><td>ISSUED FOR TENDER REVIEW</td><td>JB</td></tr><tr><td>A</td><td>21.10.2011</td><td>ISSUED FOR REVIEW</td><td>JB</td></tr><tr><td>REV</td><td>DATE</td><td>DESCRIPTION</td><td>RVD</td></tr></table>				2	12.09.2013	AS CONSTRUCTED	DP	1	25.02.2013	ISSUED FOR CONSTRUCTION: SHEET 05-C-508 ADDED	AP	0	26.03.2012	ISSUED FOR CONSTRUCTION	AP	C	22.11.2011	ISSUED FOR TENDER	AP	B	11.11.2011	ISSUED FOR TENDER REVIEW	JB	A	21.10.2011	ISSUED FOR REVIEW	JB	REV	DATE	DESCRIPTION	RVD	<table><tr><td>REV</td><td>DATE</td><td>DESCRIPTION</td><td>RVD</td></tr></table>				REV	DATE	DESCRIPTION	RVD	JANDAKOT AIRPORT HOLDINGS PTY. LTD.				<div><div><div>PERTH</div><div><div><div>BG</div><div>&amp;E</div></div><div>PERTH • MELBOURNE • SYDNEY • DUBAI • ABU DHABI</div></div><div><div>phone: +61 8 9394 3300</div><div>fax: +61 8 9394 3300</div><div>email: info@bgandecom</div><div>web: www.bgandecom</div></div></div></div>				CLIENT PROJECT JANDAKOT AIRPORT REDEVELOPMENT PRECINCT 5				<table><tr><td colspan="4">STATUS AS CONSTRUCTED</td><td colspan="4">TITLE DRAWING INDEX, SITE PLAN &amp; LOCALITY PLAN</td></tr><tr><td colspan="2">DRAWN JSB</td><td colspan="2">DESIGNED JSB</td><td colspan="2">CHECKED AP</td><td colspan="2">APPROVED A.P</td><td colspan="2">PROJECT No. P10268.01</td><td colspan="2">DRAWING No. 05-C-001</td><td colspan="2">REV. 2</td></tr><tr><td colspan="2">DATUM AHD</td><td colspan="2">GRID PCG</td><td colspan="2">SCALE AS SHOWN</td><td colspan="2">AT A1 SIZE</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr></table>				STATUS AS CONSTRUCTED				TITLE DRAWING INDEX, SITE PLAN & LOCALITY PLAN				DRAWN JSB		DESIGNED JSB		CHECKED AP		APPROVED A.P		PROJECT No. P10268.01		DRAWING No. 05-C-001		REV. 2		DATUM AHD		GRID PCG		SCALE AS SHOWN		AT A1 SIZE							
2	12.09.2013	AS CONSTRUCTED	DP																																																																																								
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DATUM AHD		GRID PCG		SCALE AS SHOWN		AT A1 SIZE																																																																																					

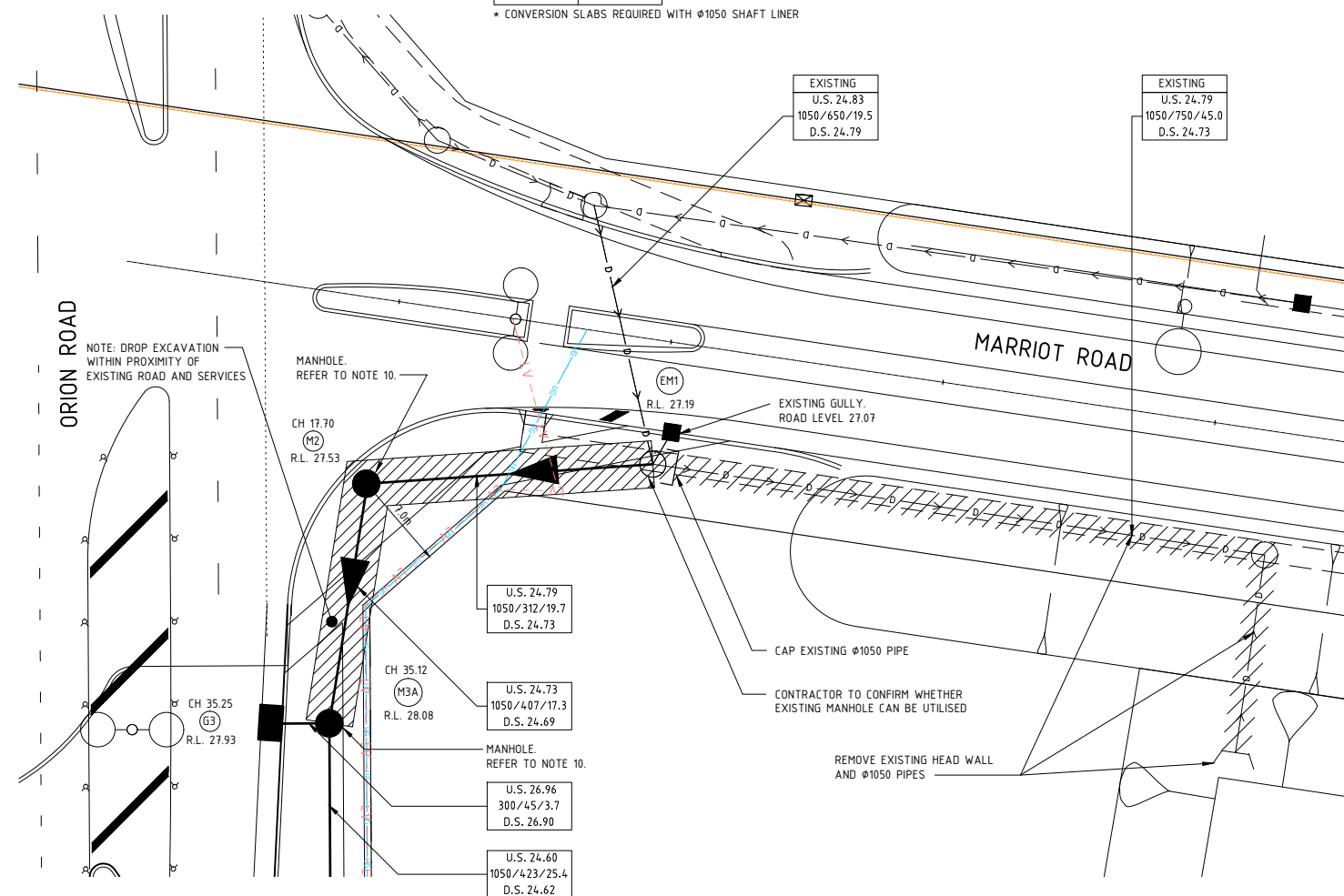


1. SERVICE LOCATION DIAGRAMMATIC ONLY - CONTACT SERVICE AUTHORITIES FOR EXACT IN GROUND LOCATIONS PRIOR TO COMMENCEMENT OF WORK.
2. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
3. ALL PIPES SHALL BE SPIGOT AND SOCKET TYPE WITH RUBBER RING JOINTS, RCP CLASS 2 UNLESS OTHERWISE NOTED.
4. CONSTRUCTION PLANT SHALL NOT BE PERMITTED TO TRAVEL OVER UNPAVED PAVED PAVEMENT UNTIL A MINIMUM THICKNESS OF COMPACTED BACKFILL HAS BEEN PLACED TO PROVIDE ADEQUATE PROTECTION.
5. MATERIALS FOR BEDDING, HAUNCH AND SIDE ZONES SHALL COMPLY WITH THE WITH THE RELEVANT REQUIREMENTS OF TABLE 3 & 4 OF AS3732S FOR HS3 SUPPORT CONDITIONS.
6. BEDDING AND BACKFILL MATERIAL TO BE PLACED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATION.
7. UNSUITABLE SITE CONDITIONS SHALL BE TREATED IN ACCORDANCE WITH THE SPECIFICATION.
8. CONTRACTOR TO EXERCISE EXTREME CARE IN THE VICINITY OF THE U/GROUND POWER, TELSTRA CONDUITS AND FIBRE OPTIC CABLES.
9. ALL ROAD GULLIES SHALL BE CLASS D BICYCLE FRIENDLY TYPE.
10. ALL MANHOLE DRAINAGE PITS AS PER MAIN ROADS STANDARDS. REFER TO DRAWING 200231-084 FOR SELECTION GUIDE.

	PROPOSED DRAINAGE LINE & FLOW DIRECTION
	EXISTING DRAINAGE LINE & FLOW DIRECTION
	EXISTING DRAINAGE LINE TO BE REMOVED
	PROPOSED MANHOLE
	PROPOSED SIDE ENTRY PIT
	PROPOSED DOUBLE SIDE ENTRY PIT
	DRAINAGE STRUCTURE NUMBER - J = LOT CONNECTION PIT, M = MANHOLE, S = SIDE ENTRY PIT, G = GULLY PIT.
<div data-bbox="2445 426 2531 476"><div>U.S. 24.90</div><div>750/833/50.0</div><div>D.S. 24.84</div></div>	UPSTREAM INVERT LEVEL DIA/GRADE/LENGTH OF PIPE DOWNSTREAM INVERT LEVEL
	SEWER MAIN
<div data-bbox="2460 533 2531 567"><div>D.I.L. 26.05</div><div>S.I.L. 27.18</div><div>CL 0.23</div></div>	DRAINAGE INVERT LEVEL SEWER INVERT LEVEL CLEARANCE
	GULLY GRATE
F.S.L.	FINISH LOT DESIGN SURFACE (APPROXIMATE ONLY)

PIPE SIZE MAX	NOM. DIA CLASS '2' R.C. LINER
375	1050
600	1200
750	1500*
900	1800*
1050	2250*

\* CONVERSION SLABS REQUIRED WITH Ø1050 SHAFT LINER



ENLARGEMENT 1

2	12.09.2013	AS CONSTRUCTED	DP				
1	18.04.2012	ADJUSTED DESIGN TO SUIT NEW LOT LEVELS	AP				
0	26.03.2012	ISSUED FOR CONSTRUCTION	AP				
C	22.11.2011	ISSUED FOR TENDER	AP				
B	11.11.2011	ISSUED FOR TENDER REVIEW	JB				
A	21.10.2011	ISSUED FOR REVIEW	JB				
REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
REVISIONS				REVISIONS			

P:\P10268-01 JANDAKOT AIRPORT PRECINCT 5\100 DRAWINGS\102 CIVIL\AUTOCAD\P10268\_01\_05-C-500 DRAINAGE.DWG  
12/09/2012 3:15:41 PM

CLIENT

JANDAKOT AIRPORT HOLDINGS  
PTY. LTD.



**PERTH**

phone: +61 8 9384 3300  
fax: +61 8 9384 3800  
email: [info@bgseng.com](mailto:info@bgseng.com)  
web: [www.bgseng.com](http://www.bgseng.com)

**SYDNEY • DUBAI • ABU DHABI**

PROJECT  
JANDAKOT AIRPORT REDEVELOPMENT  
PRECINCT 5

STATUS	AS CONSTRUCTED
--------	----------------

NT	DRAWN	DESIGNED	CHECKED	APPROVED
	JSB	JSB	AP	AP
	DATUM	GRID	SCALE	
	AHD	PCG	1:1000	AT A1

TITLE	DRAINAGE PLAN SHEET 1 OF 4
-------	-------------------------------

PROJECT No.	DRAWING No.	REV.
P10268.01	05-C-500	2



JOINS DRG. NO 05-C-500

F.S.L. 30.70

509

F.S.L. 30.60

508

F.S.L. 30.40

507

99

8

CAPPED END

ORION ROAD

NOTE: ALL LOT CONNECTION PITS TO BE Ø1050 MANHOLE AS PER CITY OF COCKBURN STD. DRG. 2423B03-08.

EXISTING TELSTRA CONDUITS

EXISTING TELSTRA OPTIC FIBRE CONDUITS

## LEGEND

- PROPOSED DRAINAGE LINE & FLOW DIRECTION  
—○— EXISTING DRAINAGE LINE & FLOW DIRECTION  
● PROPOSED MANHOLE  
■ PROPOSED SIDE ENTRY PIT  
■ PROPOSED DOUBLE SIDE ENTRY PIT  
⑫ DRAINAGE STRUCTURE NUMBER - J = LOT CONNECTION PIT, M = MANHOLE, S = SIDE ENTRY PIT, G = GULLY PIT.  
U.S. 24.90  
750/833/50.0  
D.S. 24.84  
UPSTREAM INVERT LEVEL  
DIA/GRADE/LENGTH OF PIPE  
DOWNSTREAM INVERT LEVEL  
--- SEWER MAIN  
D.I.L. 26.05  
S.I.L. 27.18  
CL 0.23  
DRAINAGE INVERT LEVEL  
SEWER INVERT LEVEL  
CLEARANCE  
F.S.L. FINISH LOT DESIGN SURFACE (APPROXIMATE ONLY)

## NOTES

- SERVICE LOCATION DIAGRAMMATIC ONLY - CONTACT SERVICE AUTHORITIES FOR EXACT IN GROUND LOCATIONS PRIOR TO COMMENCEMENT OF WORK.
- ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
- ALL PIPES SHALL BE SPIGOT AND SOCKET TYPE WITH RUBBER RING JOINTS, RCP CLASS 2 UNLESS OTHERWISE NOTED.
- CONSTRUCTION PLANT SHALL NOT BE PERMITTED TO TRAVEL OVER COMPACTED PIPELINE UNTIL A MINIMUM THICKNESS OF COMPACTED BACKFILL HAS BEEN PLACED TO PROVIDE ADEQUATE PROTECTION.
- MATERIALS FOR BEDDING, HAUNCH AND SIDE ZONES SHALL COMPLY WITH THE RELEVANT REQUIREMENTS OF TABLE 3 & 4 OF AS3725 FOR HS3 SUPPORT CONDITIONS.
- BEDDING AND BACKFILL MATERIAL TO BE PLACED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATION.
- UNSATURABLE IN SITU BEDDING MATERIAL SHALL BE TREATED IN ACCORDANCE WITH THE SPECIFICATION.
- CONTRACTOR TO EXERCISE EXTREME CARE IN THE VICINITY OF THE U/GROUND POWER, TELSTRA CONDUITS AND FIBRE OPTIC CABLES.

## TABLE - PIT LINER SIZES

PIPE SIZE MAX	NOM. DIA CLASS '2' R.C. LINER
375	1050
600	1200
750	1500*
900	1800*
1050	2250*

\* CONVERSION SLABS REQUIRED WITH Ø1050 SHAFT LINER

REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
2	12.09.2013	AS CONSTRUCTED	DP				
1	19.04.2012	ADJUSTED DESIGN TO SUIT NEW LOT LEVELS	AP				
0	26.03.2012	ISSUED FOR CONSTRUCTION	AP				
C	22.11.2011	ISSUED FOR TENDER	AP				
B	11.11.2011	ISSUED FOR TENDER REVIEW	JB				
A	21.10.2011	ISSUED FOR REVIEW	JB				

1:\P10268-01 JANDAKOT AIRPORT PRECINCT 5\100 DRAWINGS\100 CIVIL\AUTOCAD\PT10268\_01\_05-C-501 DRAINAGE.DWG  
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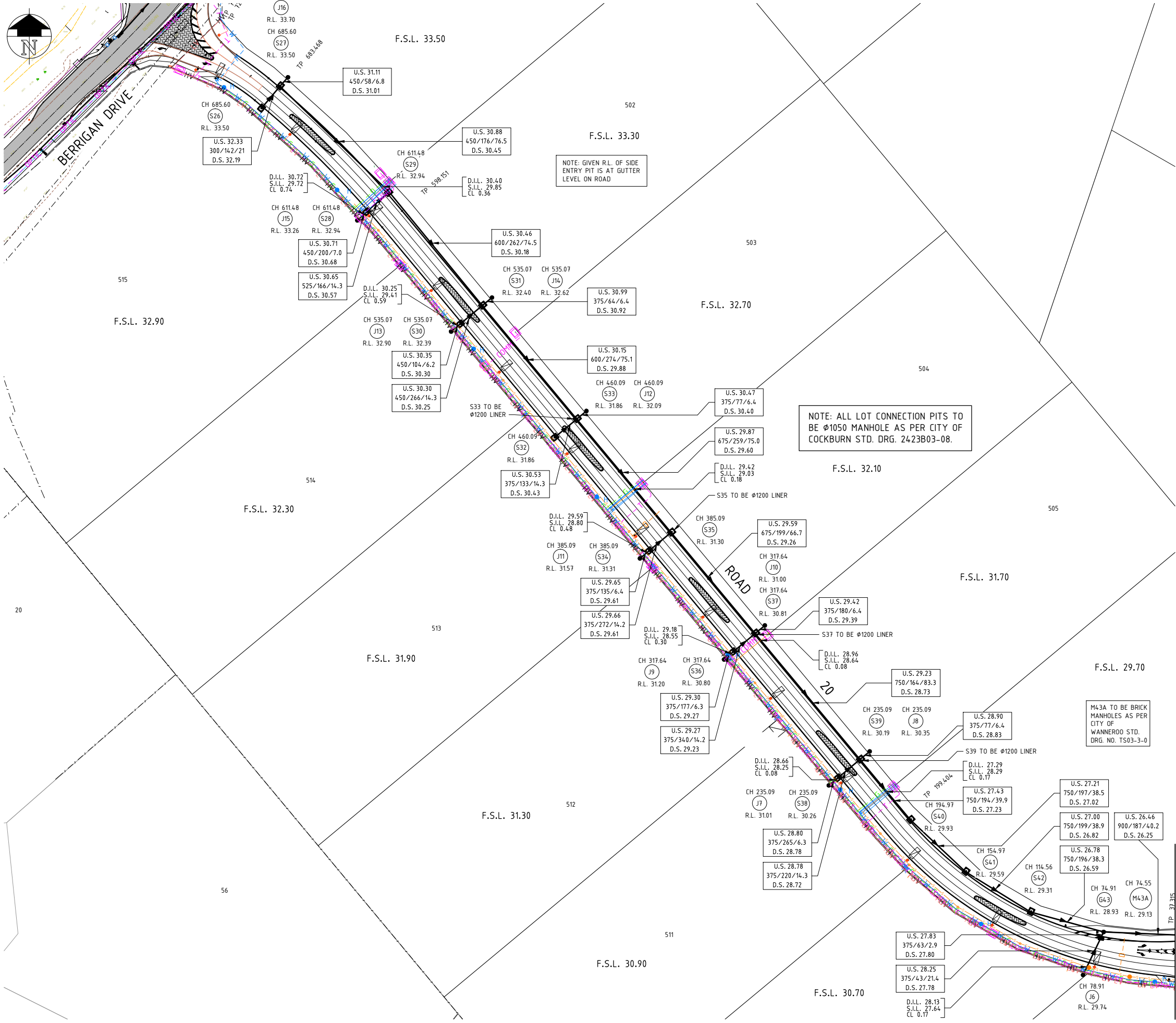
PROJECT  
JANDAKOT AIRPORT REDEVELOPMENT  
PRECINCT 5

STATUS AS CONSTRUCTED			
DRAWN JSB	DESIGNED JSB	CHECKED AP	APPROVED AP
DATUM AHD	GRID PCG	SCALE 1:1000	AT A1 SIZE

TITLE  
DRAINAGE PLAN  
SHEET 2 OF 4

PROJECT No. P10268.01	DRAWING No. 05-C-501	REV. 2
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LEGEND

- PROPOSED DRAINAGE LINE & FLOW DIRECTION
- EXISTING DRAINAGE LINE & FLOW DIRECTION
- PROPOSED MANHOLE
- PROPOSED SIDE ENTRY PIT
- PROPOSED DOUBLE SIDE ENTRY PIT
- DRAINAGE STRUCTURE NUMBER - J = LOT CONNECTION PIT, M = MANHOLE, S = SIDE ENTRY PIT, G = GULLY PIT.
- UPSTREAM INVERT LEVEL  
DIA/GRADE/LENGTH OF PIPE  
DOWNSTREAM INVERT LEVEL
- SEWER MAIN
- DRAINAGE INVERT LEVEL  
SEWER INVERT LEVEL  
CLEARANCE
- FINISH LOT DESIGN SURFACE (APPROXIMATE ONLY)

NOTES

- SERVICE LOCATION DIAGRAMMATIC ONLY - CONTACT SERVICE AUTHORITIES FOR EXACT IN GROUND LOCATIONS PRIOR TO COMMENCEMENT OF WORK.
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\* CONVERSION SLABS REQUIRED WITH Ø1050 SHAFT LINER

REV	DATE	DESCRIPTION	RVD
2	12.09.2013	AS CONSTRUCTED	DP
1	19.04.2012	ADJUSTED DESIGN TO SUIT NEW LOT LEVELS	AP
0	26.03.2012	ISSUED FOR CONSTRUCTION	AP
C	22.11.2011	ISSUED FOR TENDER	AP
B	11.11.2011	ISSUED FOR TENDER REVIEW	JB
A	21.10.2011	ISSUED FOR REVIEW	JB
REV	DATE	DESCRIPTION	RVD

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**BG & E**  
PERTH  
phone: +61 8 9384 3300  
fax: +61 8 9384 3300  
email: info@bgandegroup.com  
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JANDAKOT AIRPORT REDEVELOPMENT  
PRECINCT 5

AS CONSTRUCTED			
DRAWN	DESIGNED	CHECKED	APPROVED
JSB	JSB	AP	AP
DATUM	GRID	SCALE	AT A1 SIZE
AHD	PCG	1:1000	

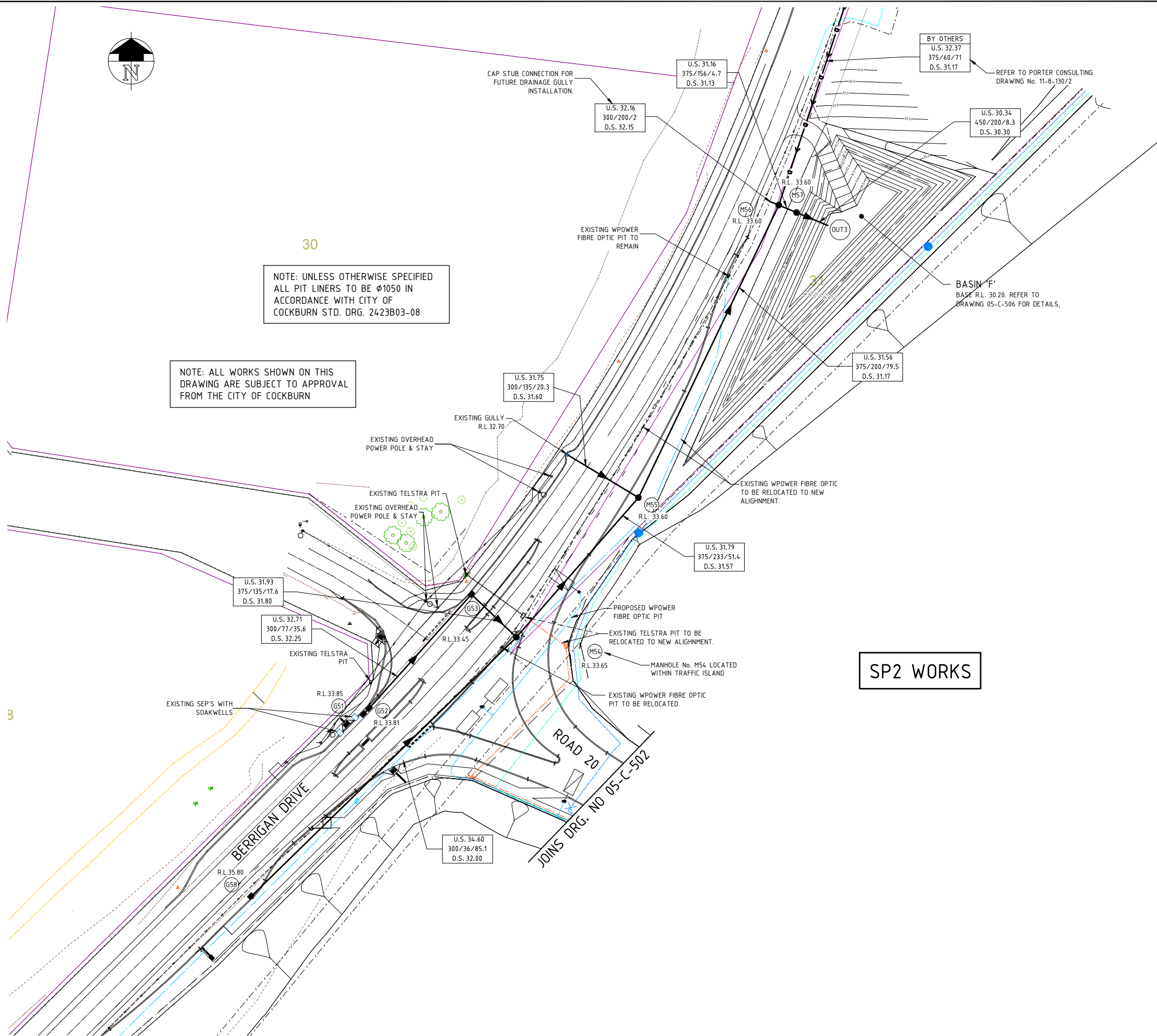
DRAINAGE PLAN SHEET 3 OF 4		
PROJECT No.	DRAWING No.	REV.
P10268.01	05-C-502	2



30

NOTE: UNLESS OTHERWISE SPECIFIED  
ALL PIT LINERS TO BE Ø1050 IN  
ACCORDANCE WITH CITY OF  
COCKBURN STD. DRG. 2423B03-08

NOTE: ALL WORKS SHOWN ON THIS  
DRAWING ARE SUBJECT TO APPROVAL  
FROM THE CITY OF COCKBURN



### LEGEND

- PROPOSED DRAINAGE LINE & FLOW DIRECTION
- EXISTING DRAINAGE LINE & FLOW DIRECTION
- PROPOSED MANHOLE
- PROPOSED SIDE ENTRY PIT
- PROPOSED DOUBLE SIDE ENTRY PIT
- DRAINAGE STRUCTURE NUMBER - M = MANHOLE, S = SIDE ENTRY PIT, G = GULLY PIT.
- UPSTREAM INVERT LEVEL DIA/GRADE/LENGTH OF PIPE DOWNSTREAM INVERT LEVEL
- EXISTING WESTERN POWER FIBRE OPTIC
- EXISTING TELSTRA
- EXISTING OVERHEAD POWER

### NOTES

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### TABLE - PIT LINER SIZES

PIPE SIZE MAX	NOM. DIA CLASS '2' R.C. LINER
375	1050
600	1200
750	1500*
900	1800*
1050	2250*

\* CONVERSION SLABS REQUIRED WITH Ø1050 SHAFT LINER

REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
1	03.08.2012	AMENDED AS PER RSA	AP				
0	26.03.2012	ISSUED FOR CONSTRUCTION	AP				
E	22.02.2012	MINOR DRAINAGE AMENDMENTS	AC				
D	20.12.2011	ADDITIONAL DRAINAGE AS SHOWN	JB				
C	22.11.2011	ISSUED FOR TENDER	AP				
B	11.11.2011	ISSUED FOR TENDER REVIEW	JB	3	12.09.2013	AS CONSTRUCTED	DP
A	21.10.2011	ISSUED FOR REVIEW	JB	2	29.08.2012	BASIN 'F' UPDATED	GC
REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD

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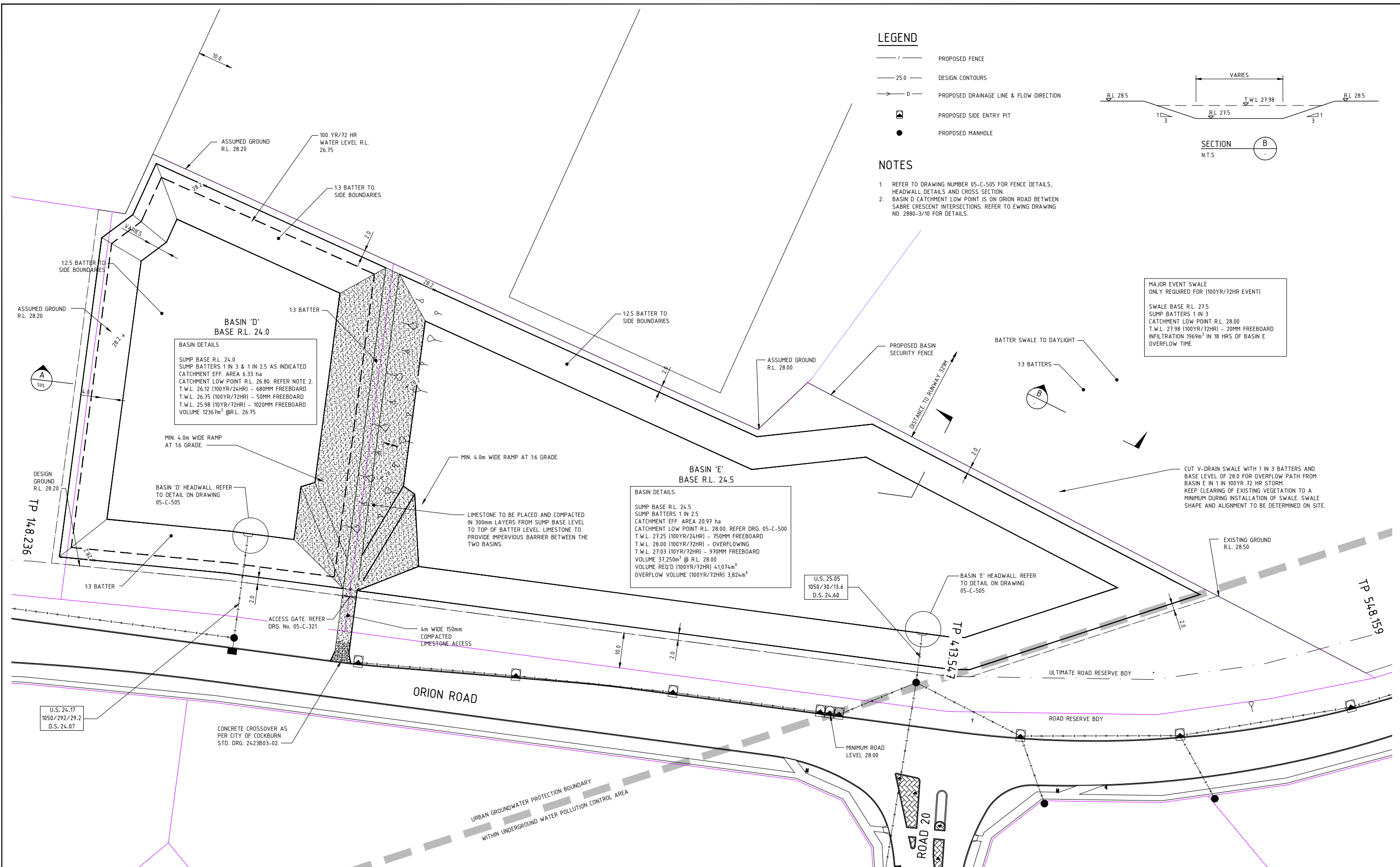
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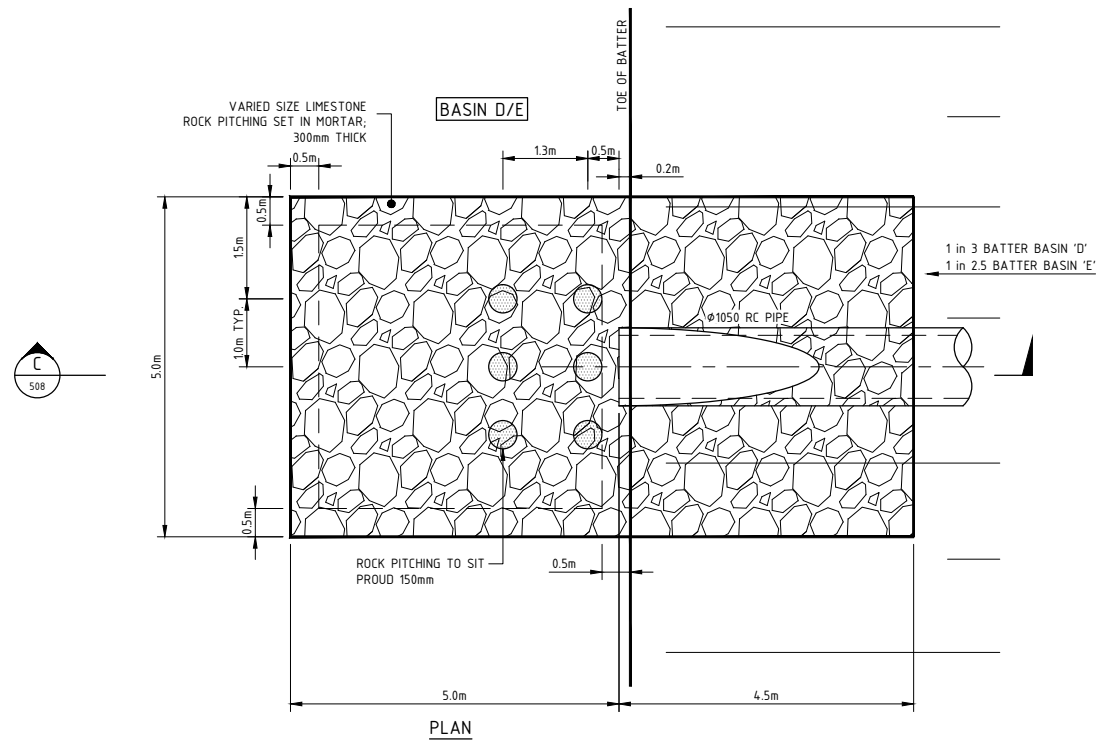
JANDAKOT AIRPORT REDEVELOPMENT  
PRECINCT 5

AS CONSTRUCTED			
DRAWN	DESIGNED	CHECKED	APPROVED
JSB	JSB	AP	AP
DATUM	GRID	SCALE	
AHD	PCG	1:500	

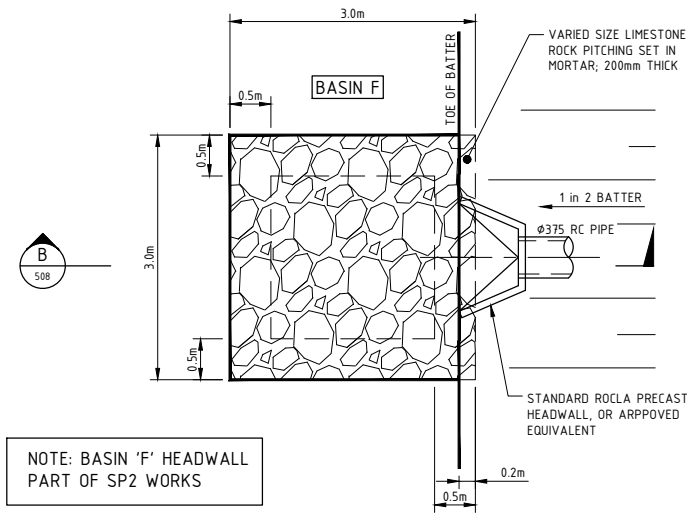
DRAINAGE PLAN  
SHEET 4 OF 4

PROJECT No.	DRAWING No.	REV.
P10268.01	05-C-503	3

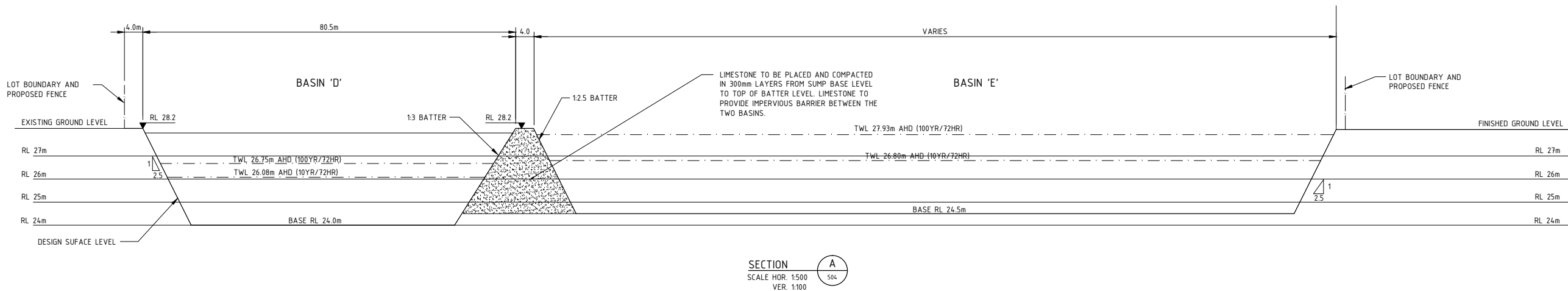




**BASINS 'D' AND 'E' DISCHARGE HEADWALL DETAIL**  
N.T.S.



**BASIN 'F' DISCHARGE HEADWALL DETAIL**  
N.T.S.



REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
2	12.09.2013	AS CONSTRUCTED	DP				
1	25.02.2013	REISSUED FOR CONSTRUCTION	AP				
0	26.03.2012	ISSUED FOR CONSTRUCTION	AP				
C	22.11.2011	ISSUED FOR TENDER	AP				
B	11.11.2011	ISSUED FOR TENDER REVIEW	JB				
A	21.10.2011	ISSUED FOR REVIEW	JB				

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fax: +61 8 9384 3300  
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PROJECT  
JANDAKOT AIRPORT REDEVELOPMENT  
PRECINCT 5

STATUS			
AS CONSTRUCTED			
DRAWN JSB	DESIGNED JSB	CHECKED AP	APPROVED AP
DATUM AHD	GRID PCG	SCALE 1:1000	AT A1 SIZE

TITLE		
DRAINAGE BASIN SECTIONS AND DETAILS SHEET 1 OF 2		
PROJECT No. P10268.01	DRAWING No. 05-C-505	REV. 2

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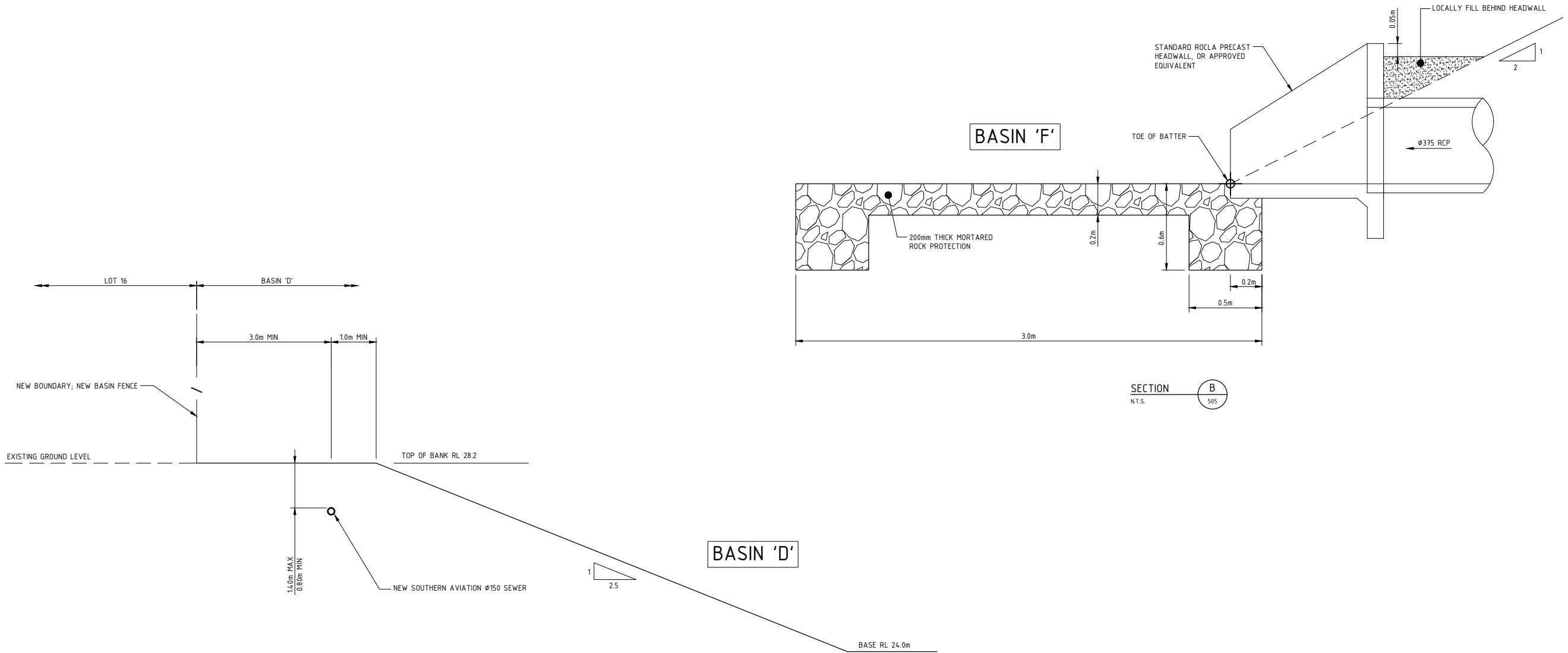


- LEGEND**
- BASIN 'D' LOTS CATCHMENT AREA (ASSUMED 50% IMPERVIOUS AREA) = 79,886m<sup>2</sup>
  - BASIN 'E' LOTS CATCHMENT AREA (ASSUMED 50% IMPERVIOUS AREA) = 362,276m<sup>2</sup>
  - BASIN 'D' ROAD CATCHMENT AREA (ASSUMED 80% IMPERVIOUS AREA) = 31,739m<sup>2</sup>
  - BASIN 'E' ROAD CATCHMENT AREA (ASSUMED 80% IMPERVIOUS AREA) = 35,651m<sup>2</sup>
  - BASIN 'F' ROAD CATCHMENT AREA (ASSUMED 80% IMPERVIOUS AREA) = 17,461m<sup>2</sup>

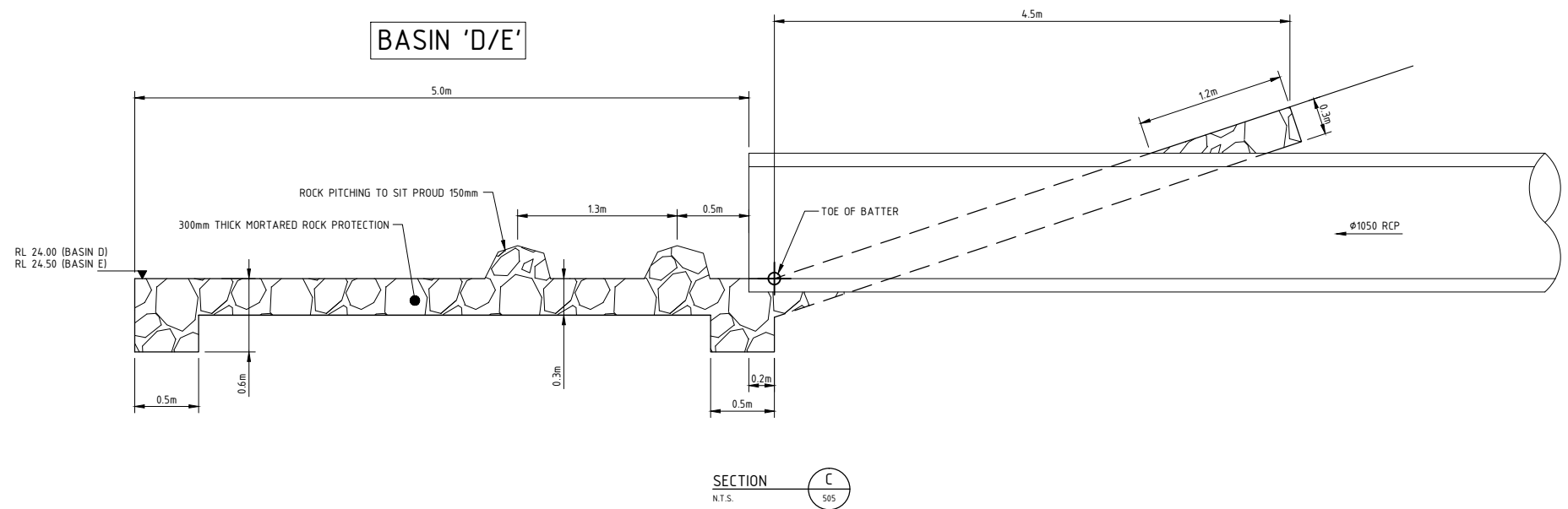
**BASIN 'F'**

TOTAL CATCHMENT AREA = 1.75Ha  
EFFECTIVE AREA (80%) = 1.40Ha

<table><tr><td>2</td><td>12.09.2013</td><td>AS CONSTRUCTED</td><td>DP</td></tr><tr><td>1</td><td>29.08.2012</td><td>REVISED LOT BOUNDARIES</td><td>GC</td></tr><tr><td>0</td><td>26.03.2012</td><td>ISSUED FOR CONSTRUCTION</td><td>AP</td></tr><tr><td>D</td><td>30.11.2011</td><td>CATCHMENTS CHANGED</td><td>AP</td></tr><tr><td>C</td><td>22.11.2011</td><td>ISSUED FOR TENDER</td><td>AP</td></tr><tr><td>B</td><td>11.11.2011</td><td>ISSUED FOR TENDER REVIEW</td><td>JB</td></tr><tr><td>A</td><td>21.10.2011</td><td>ISSUED FOR REVIEW</td><td>JB</td></tr><tr><td>REV</td><td>DATE</td><td>DESCRIPTION</td><td>RVD</td></tr></table>				2	12.09.2013	AS CONSTRUCTED	DP	1	29.08.2012	REVISED LOT BOUNDARIES	GC	0	26.03.2012	ISSUED FOR CONSTRUCTION	AP	D	30.11.2011	CATCHMENTS CHANGED	AP	C	22.11.2011	ISSUED FOR TENDER	AP	B	11.11.2011	ISSUED FOR TENDER REVIEW	JB	A	21.10.2011	ISSUED FOR REVIEW	JB	REV	DATE	DESCRIPTION	RVD	<table><tr><td>REV</td><td>DATE</td><td>DESCRIPTION</td><td>RVD</td></tr></table>				REV	DATE	DESCRIPTION	RVD	CLIENT		PROJECT		STATUS		TITLE	
2	12.09.2013	AS CONSTRUCTED	DP																																																
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REV	DATE	DESCRIPTION	RVD																																																
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JANDAKOT AIRPORT HOLDINGS PTY. LTD.				 PERTH • MELBOURNE • SYDNEY • DUBAI • ABU DHABI		JANDAKOT AIRPORT REDEVELOPMENT PRECINCT 5		AS CONSTRUCTED		DRAINAGE CATCHMENT PLAN																																									
<table><tr><td colspan="2">DRAWN</td><td>DESIGNED</td><td>CHECKED</td><td>APPROVED</td></tr><tr><td colspan="2">JSB</td><td>JSB</td><td>AP</td><td>AP</td></tr></table>				DRAWN		DESIGNED	CHECKED	APPROVED	JSB		JSB	AP	AP	<table><tr><td>DATUM</td><td>GRID</td><td>SCALE</td><td colspan="2">AT A1 SIZE</td></tr><tr><td>AHD</td><td>PCG</td><td>1:1000</td><td colspan="2"></td></tr></table>				DATUM	GRID	SCALE	AT A1 SIZE		AHD	PCG	1:1000			<table><tr><td>PROJECT No.</td><td>DRAWING No.</td><td>REV.</td></tr><tr><td>P10268.01</td><td>05-C-507</td><td>2</td></tr></table>		PROJECT No.	DRAWING No.	REV.	P10268.01	05-C-507	2																
DRAWN		DESIGNED	CHECKED	APPROVED																																															
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AHD	PCG	1:1000																																																	
PROJECT No.	DRAWING No.	REV.																																																	
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BASIN 'D' BATTER DETAIL - LOT 16 SIDE BOUNDARY  
SCALE 1:50



REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
1	12.09.2013	AS CONSTRUCTED	DP				
0	25.02.2013	ISSUED FOR CONSTRUCTION	AP				

REVISIONS

JANDAKOT AIRPORT HOLDINGS  
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**BG & E**  
PERTH  
phone: +61 8 9384 3300  
fax: +61 8 9384 3300  
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JANDAKOT AIRPORT REDEVELOPMENT  
PRECINCT 5

AS CONSTRUCTED			
DRAWN	DESIGNED	CHECKED	APPROVED
JSB	JSB	AP	AP
DATUM	GRID	SCALE	
AHD	PCG	1:1000	

DRAINAGE BASIN SECTIONS AND DETAILS SHEET 2 OF 2		
PROJECT No.	DRAWING No.	REV.
P10268.01	05-C-508	1

DRAINAGE STRUCTURES ON DRAWING 05-C-500					
STRUC No.	STRUC TYPE	CO-ORDINATES		REF PT. ELEV.	COMMENTS
		EASTING	NORTHING		
EM1	-	54923.223	247675.896	27.19	EXISTING MANHOLE
M2	-	54902.366	247674.485	27.60	MANHOLE
M3A	SRN	54899.678	247657.049	28.14	MANHOLE
G3	TGT	54896.237	247657.029	27.93	GULLY
M4A	DRN	54899.829	247631.629	28.47	MANHOLE
G4	TGT	54894.935	247631.959	28.23	GULLY
M5A	DRN	54894.496	247591.488	28.91	MANHOLE
G5	TGT	54891.392	247591.901	28.70	GULLY
M6A	DRN	54889.841	247556.457	29.23	MANHOLE
G6	TGT	54886.873	247556.851	29.03	GULLY
M7A	DRN	54879.560	247479.091	29.17	MANHOLE
G7	TGT	54876.584	247479.495	28.97	GULLY
S10	TEN	54871.938	247443.811	28.75	SIDE ENTRY PIT
S11	TEN	54868.151	247398.928	28.43	SIDE ENTRY PIT
S12	TEN	54863.452	247354.212	28.12	SIDE ENTRY PIT
S45	TEN	54857.518	247309.604	28.00	3 x SIDE ENTRY PITS
S24	SEN	54851.127	247209.661	28.58	SIDE ENTRY PIT
S25	SEN	54850.858	247255.211	28.18	SIDE ENTRY PIT
G44	TGT	54813.371	247290.811	28.54	GULLY
M44A	SRN-B	54813.136	247293.684	28.81	MANHOLE
J4	SRN	54832.392	247248.349	28.80	MANHOLE
J5	SWN	54812.894	247298.177	28.81	MANHOLE
M58	-	54866.839	247284.878	28.21	MANHOLE

DRAINAGE STRUCTURES ON DRAWING 05-C-501					
STRUC No.	STRUC TYPE	CO-ORDINATES		REF PT. ELEV.	COMMENTS
		EASTING	NORTHING		
J1	SWN	54821.870	246808.569	29.24	MANHOLE
S13	TEN	54827.561	246803.640	28.94	SIDE ENTRY PIT
S14	SEN	54855.803	246837.121	29.58	SIDE ENTRY PIT
S15	SEN	54877.403	246875.404	30.20	SIDE ENTRY PIT
M16	BRT	54890.218	246918.157	30.74	MANHOLE
S17	SEN	54897.767	246965.765	30.37	SIDE ENTRY PIT
S18	SEN	54894.123	247012.812	30.02	SIDE ENTRY PIT
M19	DRN	54905.700	247016.770	30.50	MANHOLE
J2	SRN	54873.656	247060.061	30.17	MANHOLE
S20	SEN	54889.812	247065.352	29.71	SIDE ENTRY PIT
S21	SEN	54874.206	247113.004	29.34	SIDE ENTRY PIT
S22	SEN	54859.262	247160.877	28.97	SIDE ENTRY PIT
J3	SRN	54833.779	247199.835	29.15	MANHOLE

DRAINAGE STRUCTURES ON DRAWING 05-C-502					
STRUC No.	STRUC TYPE	CO-ORDINATES		REF PT. ELEV.	COMMENTS
		EASTING	NORTHING		
S26	TEN	54346.119	247714.593	33.45	SIDE ENTRY PIT
S27	SEN	54354.499	247724.505	33.45	SIDE ENTRY PIT
J16	SWN	54358.962	247729.541	33.71	MANHOLE
J15	SWN	54394.194	247656.850	33.20	MANHOLE
S28	SEN	54399.657	247661.838	32.91	SIDE ENTRY PIT
S29	SEN	54409.423	247670.419	32.91	SIDE ENTRY PIT
J13	SWN	54444.1844	247600.387	32.63	MANHOLE
S30	SEN	54447.223	247604.866	32.35	SIDE ENTRY PIT
J14	SWN	54462.603	247617.650	32.63	MANHOLE
S31	SEN	54457.221	247613.174	32.35	SIDE ENTRY PIT
S32	SEN	54495.198	247547.204	31.79	SIDE ENTRY PIT
S33	SEN	54505.192	247555.519	31.79	SIDE ENTRY PIT
J12	SWN	54510.562	247560.009	32.08	MANHOLE
J11	SWN	54537.740	247485.129	31.52	MANHOLE
S34	SEN	54543.116	247489.612	31.24	SIDE ENTRY PIT
S35	SEN	54553.110	247497.926	31.24	SIDE ENTRY PIT
J9	SWN	54580.459	247433.785	31.02	MANHOLE
S36	SEN	54585.825	247438.280	30.75	SIDE ENTRY PIT
S37	SEN	54595.798	247446.619	30.75	SIDE ENTRY PIT
J10	SWN	54601.200	247451.072	31.02	MANHOLE
J7	SWN	54633.688	247369.810	30.42	MANHOLE
S38	SEN	54639.089	247374.261	30.14	SIDE ENTRY PIT
S39	SEN	54649.053	247382.612	30.14	SIDE ENTRY PIT
J8	SWN	54654.447	247387.074	30.42	MANHOLE
S40	SEN	54674.689	247351.875	29.85	SIDE ENTRY PIT
S41	SEN	54702.859	247325.390	29.55	SIDE ENTRY PIT
S42	SEN	54736.046	247304.901	29.26	SIDE ENTRY PIT
J6	SWN	54762.843	247273.504	29.65	MANHOLE
G43	TGT	54772.194	247292.997	28.92	GULLY
M43A	SRN-B	54773.286	247295.353	29.11	MANHOLE

DRAINAGE STRUCTURES ON DRAWING 05-C-503					
STRUC No.	STRUC TYPE	CO-ORDINATES		REF PT. ELEV.	COMMENTS
		EASTING	NORTHING		
ES50	-	-	-	-	EXISTING SOAKWELL
ES51	-	-	-	-	EXISTING SOAKWELL
G58	TGT	54245.727	247705.583	35.80	GULLY
G51	TGT	54272.697	247750.775	33.85	GULLY
G52	TGT	54274.092	247752.209	33.81	GULLY
G53	TGT	54299.231	247780.156	33.45	GULLY
M54	SRN	54310.549	247769.327	33.65	MANHOLE
M55	SRN	54340.495	247803.582	33.60	MANHOLE
M56	SRN	54374.928	247875.324	33.60	MANHOLE
M57	SRN	54379.291	247873.522	33.60	MANHOLE

P:\P10268.01 JANDAKOT AIRPORT PRECINCT 5\100 DRAWINGS\100 CIVIL\AUTOCAD\P10268\_01\_05-C-510 DRAINAGE.DWG

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**LEGEND**

- EXISTING SEWER PIPE AND ACCESS CHAMBER.
- EXISTING SEWER PRESSURE MAIN
- PROPOSED SEWER PIPE AND ACCESS CHAMBER.
- FUTURE SEWER PIPE
- RETICULATION AREA BOUNDARY.
- CATCHMENT AREA BOUNDARY.
- DIAMETER OF PIPE IN MILLIMETRES. IF NO SIZE SHOWN DIAMETER IS 150
- AREA OF LOT NOT SEWERED

**NOTATION**

LOT NUMBER

ACCESS CHAMBER

U8265

2.10

ACCESS CHAMBER NUMBER

DROP

ACCESS CHAMBER DEPTH (APPROX)

DIAMETER OF PIPE IN MILLIMETRES IF NO SIZE SHOWN DIAMETER IS 150

**QUANTITIES**  
LOCAL AUTHORITY: CITY OF COCKBURN

LENGTH OF SEWERS	Ø225	1488m
TOTAL No. OF MAINTENANCE SHAFTS:	15	
TOTAL No. OF ACCESS CHAMBERS:	5	
NUMBER OF LOTS SERVED	16	

<table><tr><td>2</td><td>12.09.2013</td><td>AS CONSTRUCTED</td><td>DP</td></tr><tr><td>1</td><td>29.08.2012</td><td>REVISED LOT BOUNDARIES</td><td>GC</td></tr><tr><td>0</td><td>26.03.2012</td><td>ISSUED FOR CONSTRUCTION</td><td>AP</td></tr><tr><td>C</td><td>22.11.2011</td><td>ISSUED FOR TENDER</td><td>AP</td></tr><tr><td>B</td><td>11.11.2011</td><td>ISSUED FOR TENDER REVIEW</td><td>JB</td></tr><tr><td>A</td><td>21.10.2011</td><td>ISSUED FOR REVIEW</td><td>JB</td></tr><tr><td>REV</td><td>DATE</td><td>DESCRIPTION</td><td>RVD</td></tr></table>	2	12.09.2013	AS CONSTRUCTED	DP	1	29.08.2012	REVISED LOT BOUNDARIES	GC	0	26.03.2012	ISSUED FOR CONSTRUCTION	AP	C	22.11.2011	ISSUED FOR TENDER	AP	B	11.11.2011	ISSUED FOR TENDER REVIEW	JB	A	21.10.2011	ISSUED FOR REVIEW	JB	REV	DATE	DESCRIPTION	RVD	<table><tr><td>REV</td><td>DATE</td><td>DESCRIPTION</td><td>RVD</td></tr></table>	REV	DATE	DESCRIPTION	RVD	CLIENT <b>JANDAKOT AIRPORT HOLDINGS PTY. LTD.</b>	<p>PERTH phone: +61 8 9394 3900 fax: +61 8 9394 3900 email: info@bgandegroup.com web: www.bgandegroup.com</p> <p>PERTH • MELBOURNE • SYDNEY • DUBAI • ABU DHABI</p>	PROJECT <b>JANDAKOT AIRPORT REDEVELOPMENT PRECINCT 5</b>	<table><tr><td colspan="4">STATUS <b>AS CONSTRUCTED</b></td></tr><tr><td>DRAWN JSB</td><td>DESIGNED JSB</td><td>CHECKED AP</td><td>APPROVED AP</td></tr><tr><td>DATUM AHD</td><td>GRID PCG</td><td>SCALE 1:2000</td><td>AT A1 SIZE</td></tr></table>	STATUS <b>AS CONSTRUCTED</b>				DRAWN JSB	DESIGNED JSB	CHECKED AP	APPROVED AP	DATUM AHD	GRID PCG	SCALE 1:2000	AT A1 SIZE	TITLE <b>SEWER RETICULATION SITE PLAN</b>
2	12.09.2013	AS CONSTRUCTED	DP																																															
1	29.08.2012	REVISED LOT BOUNDARIES	GC																																															
0	26.03.2012	ISSUED FOR CONSTRUCTION	AP																																															
C	22.11.2011	ISSUED FOR TENDER	AP																																															
B	11.11.2011	ISSUED FOR TENDER REVIEW	JB																																															
A	21.10.2011	ISSUED FOR REVIEW	JB																																															
REV	DATE	DESCRIPTION	RVD																																															
REV	DATE	DESCRIPTION	RVD																																															
STATUS <b>AS CONSTRUCTED</b>																																																		
DRAWN JSB	DESIGNED JSB	CHECKED AP	APPROVED AP																																															
DATUM AHD	GRID PCG	SCALE 1:2000	AT A1 SIZE																																															
P10268.01		05-C-600		2																																														

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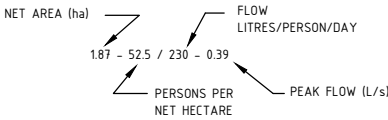
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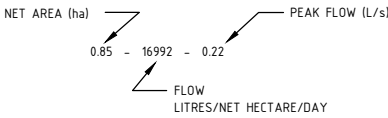
LEGEND

- EXISTING SEWER PIPE AND ACCESS CHAMBER.
- EXISTING SEWER PRESSURE MAIN
- PROPOSED SEWER PIPE AND ACCESS CHAMBER.
- FUTURE SEWER PIPE
- RETICULATION AREA BOUNDARY.
- CATCHMENT AREA BOUNDARY.
- DIAMETER OF PIPE IN MILLIMETRES  
IF NO SIZE SHOWN DIAMETER IS 150
- FLOW IN LITRES/SECOND
- WET AREA

RESIDENTIAL



NON RESIDENTIAL



										CLIENT		PROJECT		STATUS		TITLE	
2 12.09.2013 AS CONSTRUCTED DP										JANDAKOT AIRPORT HOLDINGS PTY. LTD.		JANDAKOT AIRPORT REDEVELOPMENT PRECINCT 5		AS CONSTRUCTED		SEWER RETICULATION DESIGN DATA PLAN	
1 29.08.2012 REVISED LOT BOUNDARIES GC																	
0 26.03.2012 ISSUED FOR CONSTRUCTION AP																	
C 22.11.2011 ISSUED FOR TENDER AP																	
B 11.11.2011 ISSUED FOR TENDER REVIEW JB																	
A - ISSUED FOR REVIEW AP																	
REV DATE DESCRIPTION RVD				REV DATE DESCRIPTION RVD													
REVISIONS				REVISIONS													





512  
FFL 31.50  
FSL 31.40 (APPROX)

511  
FFL 31.00  
FSL 30.90 (APPROX)

508  
FFL 30.80  
FSL 30.70 (APPROX)

507  
FFL 30.50  
FSL 30.40 (APPROX)

506  
FFL 29.80  
FSL 39.70 (APPROX)

US 28.28  
150 - 204  
D = 22.8m  
DS 28.17

IS 23.1  
U2.6

4.0  
I 4.6  
U1.3

28.6  
I 4.6  
U1.3

28.13  
I 4.6  
U1.3

28.13  
I 4.6  
U1.3

28.13  
I 4.6  
U1.3

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I 4.6  
U1.3

28.13  
I 4.6  
U1.3

28.13  
I 4.6  
U1.3

JOINS BELOW

EXISTING TELSTRA CONDUITS

EXISTING TELSTRA OPTIC FIBRE CONDUITS

STRUC No.	SEWER STRUCTURES		REF PT. ELEV.
	EASTING	NORTHING	
JK504	54659.935	247345.299	30.25
JK505	54674.632	247329.384	30.30
JK506	54699.265	247308.022	30.34
JK507	54730.889	247289.443	30.10
JK508	54765.803	247277.236	29.84
JK509	54786.501	247272.604	29.41
JK510	54836.974	247268.104	28.45
JK511	54836.170	247215.133	28.96
JK512	54849.952	247146.903	29.46
JK513	54881.084	247051.825	30.09
JK514	54890.228	247018.687	30.20
JK515	54894.919	246973.132	30.50
JK516	54841.946	247313.882	28.31

## NOTES

- THIS DRAWING TO BE READ IN CONJUNCTION WITH NOTE SHEET FOR RETICULATION PLANS STANDARD WATER CORPORATION DRAWING AA01-3-1. MAXIMUM GROUND WATER LEVEL R.L. 24.5m.
- CONTRACTOR IS RESPONSIBLE TO LOCATE AND PROTECT ALL EXISTING SERVICES AND IMPROVEMENTS ON SITE AND TO MEET THE COST OF PROTECTION, REPAIRS AND REINSTATEMENT WHERE DAMAGE IS CAUSED BY THE CONTRACTOR.
- ALL ACCESS CHAMBERS TO BE ON THE FOLLOWING ALIGNMENTS UNLESS SHOWN OTHERWISE:
  - WITHIN LOTS - 1.0m
  - WITHIN ROAD RESERVE - 3.5m
- BACKFILL TO BE COMPACTED TO 95% M.M.D.D.
- 

## LEGEND

PIPE SIZE  
GRADE  
LENGTH

PROPOSED SEWERS

EXISTING SEWERS

EXISTING PRESSURE MAIN

FUTURE SEWERS

US 37.50  
150 - 14.6  
D = 12.5m  
DS 37.40

UPSTREAM SEWER INVERT LEVEL  
PIPE SIZE - GRADE  
DISTANCE  
DOWNSTREAM SEWER INVERT LEVEL

X0000  
D 1.2  
I 1  
D

PROPOSED ACCESS CHAMBER  
ACCESS CHAMBER NUMBER  
LID CLASS, ACCESS CHAMBER DEPTH  
TYPE, D IF DROP

30

RETICULATION AREA BOUNDARY

30

FINISHED CONTOUR LEVEL

FSL

FINISHED DESIGN SURFACE LEVEL  
LOT LEVEL

FFL

FINISHED FLOOR LEVEL (DESIGN)

\*

LOTS TO BE SERVED BUT  
NOT RELEASED

IS 23.0  
U2.1

AREA OF LOT NOT GRAVITY SEWERED

LOT CONNECTION

JOINS ABOVE

REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
3	12.09.2013	AS CONSTRUCTED	DP				
2	29.08.2012	REVISED LOT BOUNDARIES	GC				
1	19.04.2012	ADJUSTED DESIGN TO SUIT NEW LOT LEVELS	AP				
0	26.03.2012	ISSUED FOR CONSTRUCTION	AP				
C	22.11.2011	ISSUED FOR TENDER	AC				
B	11.11.2011	ISSUED FOR TENDER REVIEW	JB				
A	21.10.2011	ISSUED FOR REVIEW	JB				

JANDAKOT AIRPORT HOLDINGS  
PTY. LTD.

**BG & E**

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fax: +61 8 9384 3300  
email: info@bgandegroup.com  
web: www.bgandegroup.com

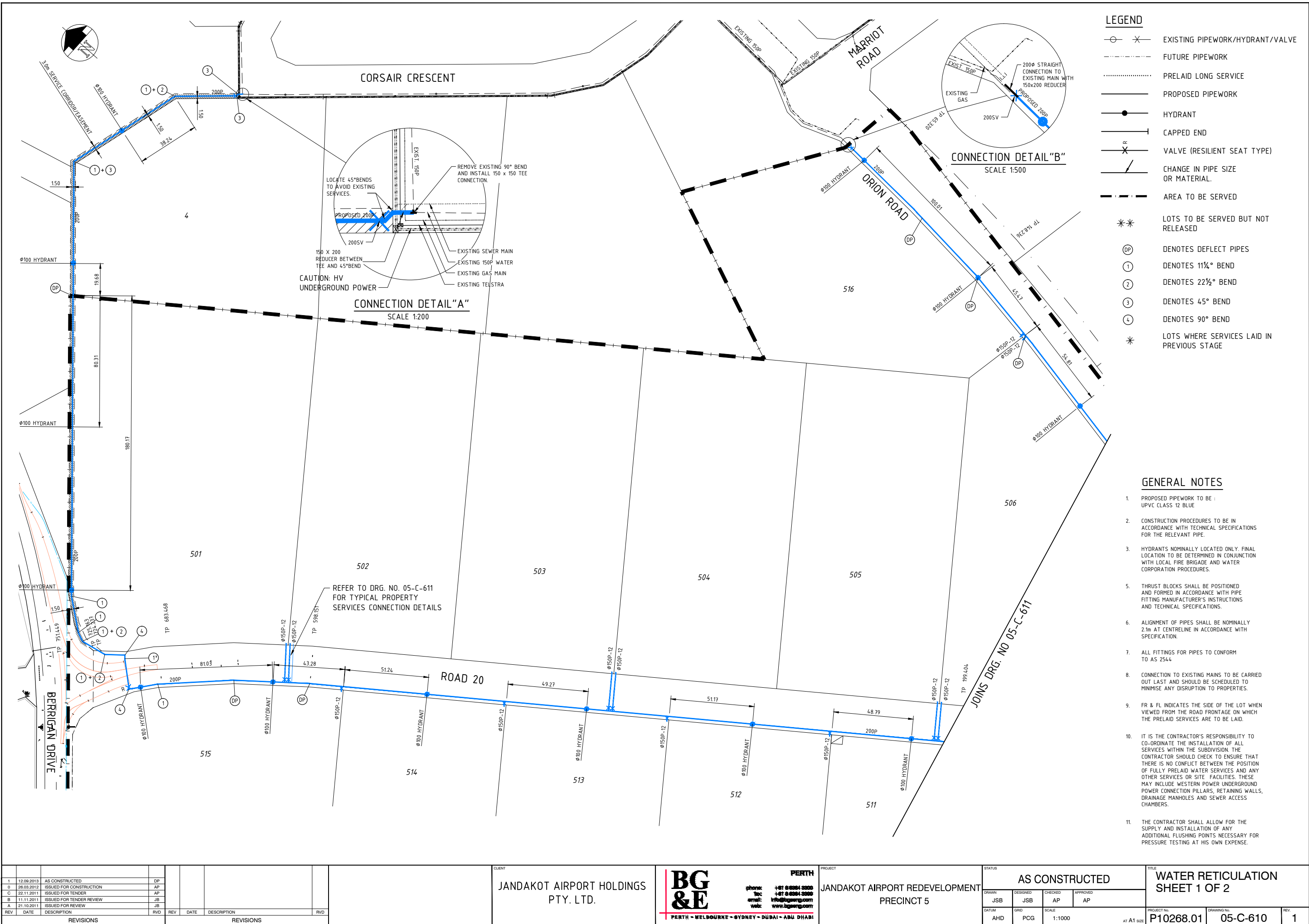
PROJECT  
JANDAKOT AIRPORT REDEVELOPMENT  
PRECINCT 5

STATUS  
AS CONSTRUCTED

DRAWN	DESIGNED	CHECKED	APPROVED
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DATUM	GRID	SCALE	AT A1 SIZE
AHD	PCG	1:1000	

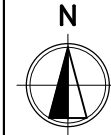
TITLE  
SEWER RETICULATION  
SHEET 2 OF 2

PROJECT No.	DRAWING No.	REV.
P10268.01	05-C-603	3

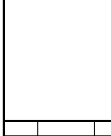




JANDAKOT AIRPORT REDEVELOPMENT  
PRECINCT 6



KEY PLAN  
SCALE NTS



LOCALITY PLAN  
SCALE N.T.S.

## DRAWING INDEX

## CIVIL DRAWINGS

C-0001	LOCALITY PLAN AND DRAWING INDEX
C-0010	GENERAL ARRANGEMENT PLAN
C-0100	PLAN AND PROFILE - CHA 0 TO CHA 600
C-0101	PLAN AND PROFILE - CHA 600 TO CHA 1200
C-0102	PLAN AND PROFILE - CHA 1200 TO CHA 1713
C-0200	ROAD LAYOUT PLAN - CHA 0 TO CHA 150
C-0201	ROAD LAYOUT PLAN - PILATUS STREET
C-0202	ROAD LAYOUT PLAN - CHA 150 TO CHA 300
C-0203	ROAD LAYOUT PLAN - CHA 300 TO CHA 475
C-0204	ROAD LAYOUT PLAN - CHA 475 TO CHA 600
C-0205	ROAD LAYOUT PLAN - CHA 600 TO CHA 750
C-0206	ROAD LAYOUT PLAN - CHA 750 TO CHA 960
C-0207	ROAD LAYOUT PLAN - CHA 960 TO CHA 1260
C-0208	ROAD LAYOUT PLAN - CHA 1260 TO CHA 1580
C-0209	ROAD LAYOUT PLAN - CHA 1580 TO CHA 1713
C-0220	INTERSECTION PLAN - PILATUS STREET / ROAD 6-1
C-0230	TURN ANALYSIS - ORION ROAD / ROAD 6-1
C-0231	TURN ANALYSIS - TURN AROUND ROUNDABOUT
C-0300	TYPICAL ROAD CROSS SECTIONS
C-0320	FENCING PLAN - SHEET 1
C-0321	FENCING PLAN - SHEET 2
C-0400	PAVEMENT MARKING AND MINOR SIGNAGE PLAN - CHA 0 TO CHA 150
C-0401	PAVEMENT MARKING AND MINOR SIGNAGE PLAN - CHA 150 TO CHA 300
C-0402	PAVEMENT MARKING AND MINOR SIGNAGE PLAN - CHA 300 TO CHA 475
C-0403	PAVEMENT MARKING AND MINOR SIGNAGE PLAN - CHA 475 TO CHA 600

C-0500	DRAINAGE PLAN - CHA 0 TO CHA 290 - SHEET 1
C-0501	DRAINAGE PLAN - CHA 290 TO CHA 560 - SHEET 2
C-0502	DRAINAGE PLAN - CHA 560 TO CHA 1090 - SHEET 3
C-0503	DRAINAGE PLAN - CHA 1090 TO CHA 1713 -SHEET 4
C-0504	DRAINAGE PLAN - SHEET 5
C-0505	DRAINAGE PLAN - SHEET 6
C-0515	DRAINAGE CATCHMENT PLAN - SHEET 1
C-0516	DRAINAGE CATCHMENT PLAN - SHEET 2

## DRAWING INDEX

## CIVIL DRAWINGS

C-0600	WATER RETICULATION - SITE AND DESIGN DATA PLAN
C-0601	SEWER RETICULATION - SHEET 1
C-0602	SEWER RETICULATION - SHEET 2
C-0610	SEWER RISING MAIN - SITE PLAN
C-0611	SEWER RISING MAIN - PLAN AND PROFILE - CHA 0 TO CHA 650
C-0612	SEWER RISING MAIN - PLAN AND PROFILE - CHA 650 TO CHA 1253
C-0630	PUMP STATION - PLAN
C-0631	PRESSURE MAIN CHARACTERISTIC CURVE
C-0670	WATER RETICULATION PLAN - OFFSITE - SHEET 1
C-0671	WATER RETICULATION PLAN - ONSITE - SHEET 1
C-0672	WATER RETICULATION PLAN - ONSITE - SHEET 2
C-0680	SERVICES PLAN - SPARE COMMS
C-0681	SERVICES PLAN - TELSTRA
C-0800	BULK EARTHWORKS PLAN - SHEET 1
C-0801	BULK EARTHWORKS PLAN - SHEET 1
C-0805	BULK EARTHWORKS SECTIONS - SHEET 1

A	31032015	ISSUED FOR 50% REVIEW		AP					
REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION			RVE
RF VISIONS				RF VISIONS					

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**Perth Office—**  
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[bgeeng.com](http://bgeeng.com)—

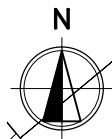


PROJECT

JANDAKOT AIRPORT  
REDEVELOPMENT  
PRECINCT 6

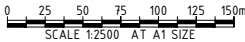
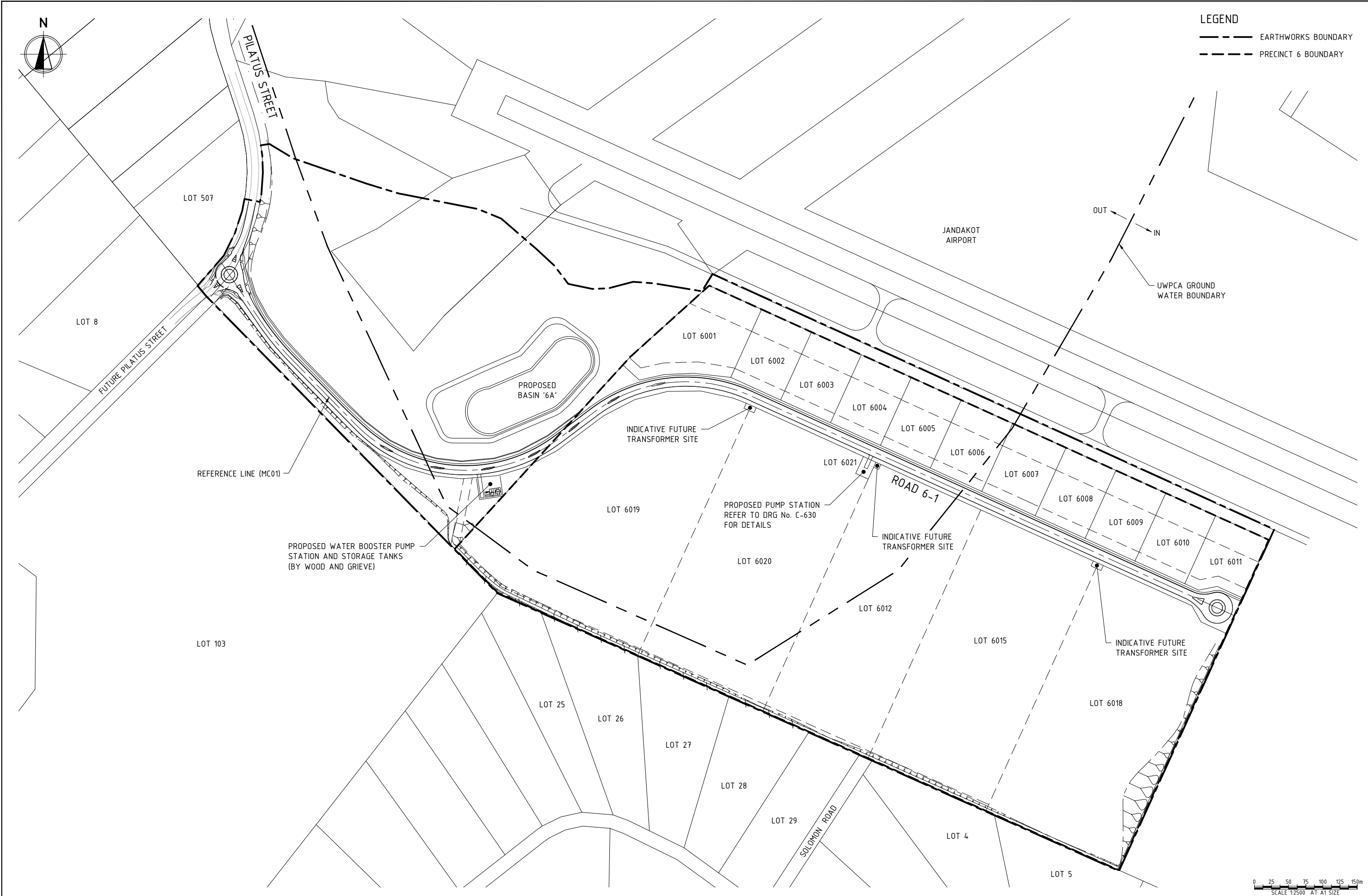
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ISSUED FOR INFORMATION			
NOT TO BE USED FOR CONSTRUCTION			
DRAWN	DESIGNED	CHECKED	APPROVED
SP	LF		
DATUM	GRID	SCALE	
AHD	PCG94	NTS	AT A1

TITLE LOCALITY PLAN AND DRAWING INDEX			
PROJECT No. P14327	DRAWING No. C-0001	REV. A	



LEGEND

- EARTHWORKS BOUNDARY
- PRECINCT 6 BOUNDARY



REVISIONS				REVISIONS			
REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
A	31.03.2015	ISSUED FOR 50% REVIEW	AP				

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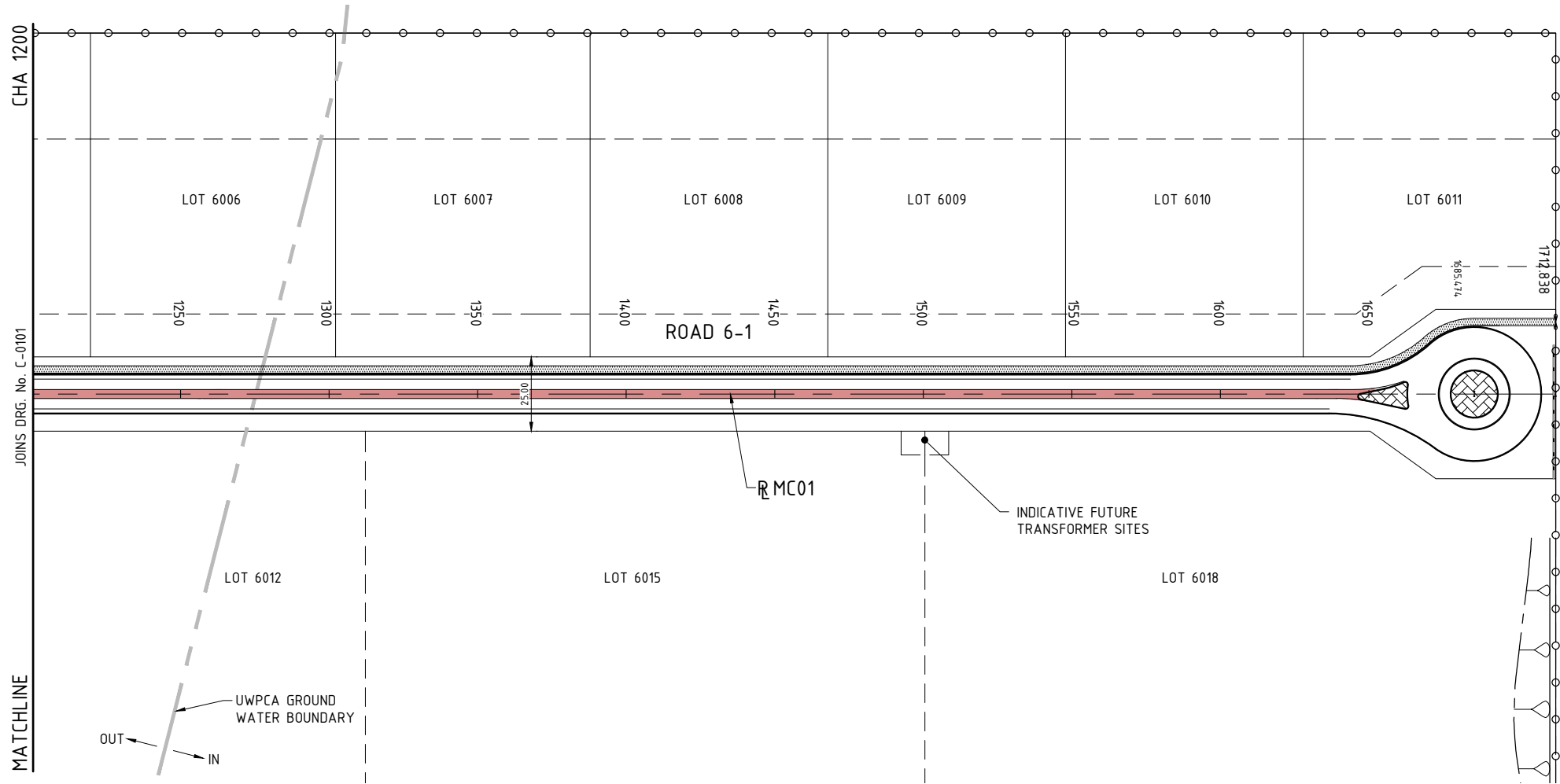
JANDAKOT AIRPORT  
REDEVELOPMENT  
PRECINCT 6

STATUS			
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NOT TO BE USED FOR CONSTRUCTION			
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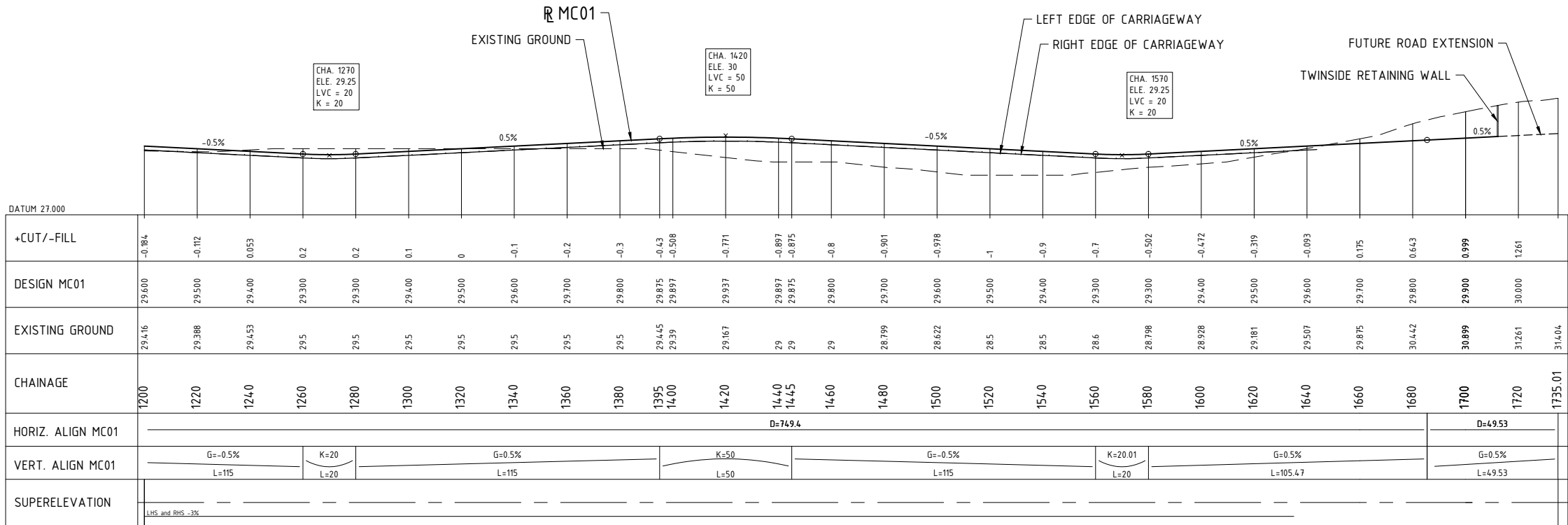
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PROJECT No.	DRAWING No.	REV	
P14327	C-0010	A	







PLAN  
SCALE 1:1000



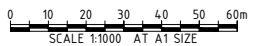
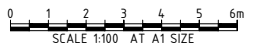
PROFILE  
SCALE 1:1000H, 1:100V

NOTES

- REFER TO DRG No. C-0001 FOR OTHER DRAWINGS IN THIS SET.
- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.

LEGEND

- CADASTRAL
- PROPOSED KERBING
- PROPOSED LINEMARKING
- PROPOSED BRICKPAVING
- PROPOSED 2.5m WIDE RED ASPHALT SHARED PATH
- PROPOSED RED ASPHALT
- PROPOSED AIRSIDE FENCE
- PROPOSED 1.8m HIGH SECURITY FENCE
- PROPOSED GATE



REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION
A					
REVISIONS			REVISIONS		

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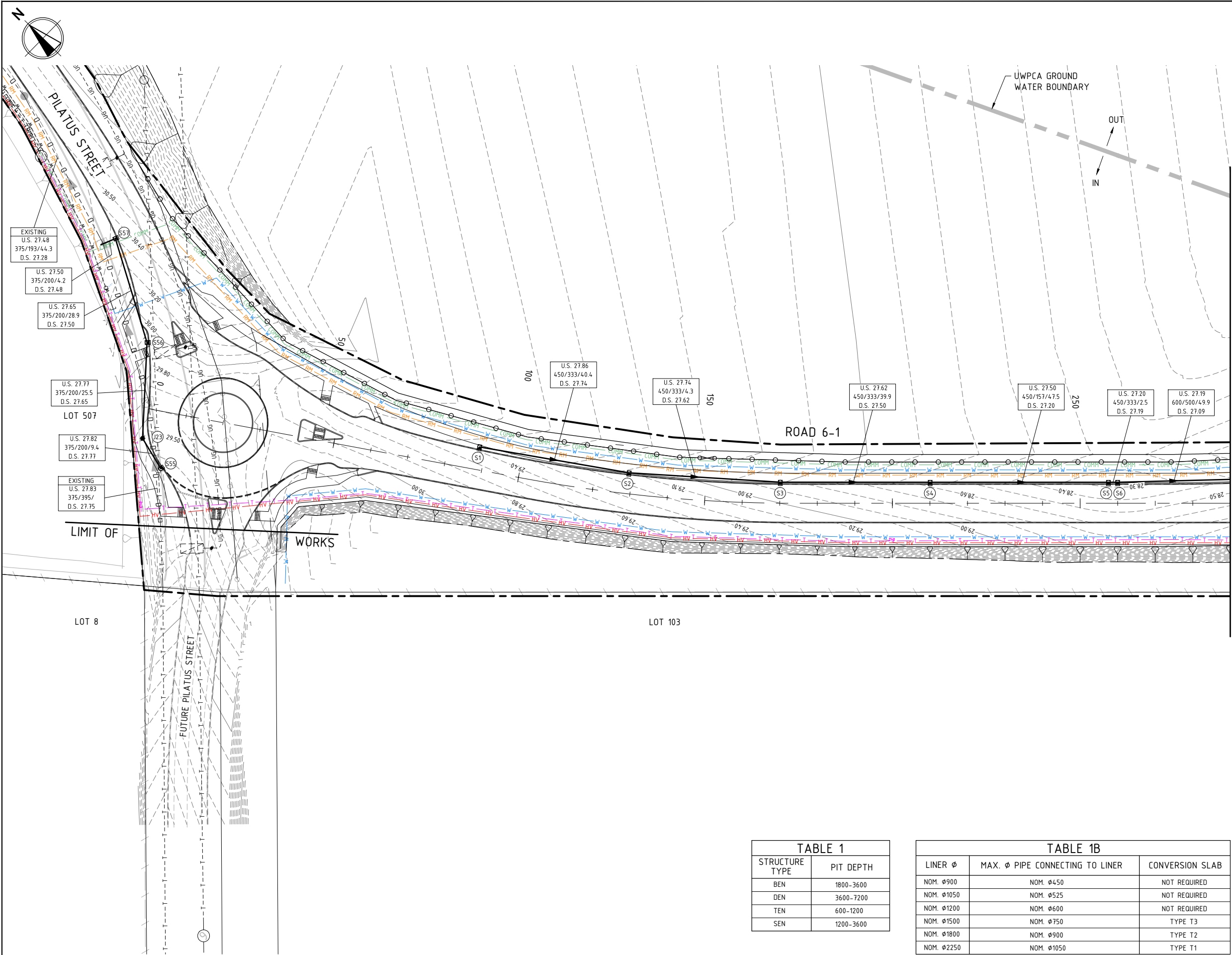
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PROJECT  
JANDAKOT AIRPORT  
REDEVELOPMENT  
PRECINCT 6

STATUS ISSUED FOR INFORMATION NOT TO BE USED FOR CONSTRUCTION			
DRAWN SP	DESIGNED LF	CHECKED	APPROVED
DATUM AHD	GRID PCG94	SCALE 1:1000H, 1:100V	AT A1 SIZE

TITLE PLAN AND PROFILE CHA 1200 TO CHA 1713			
PROJECT No. P14327	DRAWING No. C-0102	REV A	



- NOTES
1. REFER TO DRG. No. C-0001 FOR OTHER DRAWINGS IN THIS SET.
  2. REFER TO MAIN ROAD STANDARD DRAWINGS 200231-091 AND 200231-093 FOR SIDE ENTRY PITS.
  3. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
  4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ACCURATELY LOCATE ALL SERVICES AND CARRY OUT ANY SERVICE PROTECTION WORKS DEEMED NECESSARY PRIOR TO WORK COMMENCING ON SITE.
  5. ALL PIPES SHALL BE SPIGOT AND SOCKET TYPE WITH RUBBER RING JOINTS, RCP CLASS 2 UNLESS OTHERWISE NOTE.
  6. CONSTRUCTION PLANT SHALL NOT BE PERMITTED TO TRAVEL OVER COMPACTED PIPELINE UNTIL A MINIMUM THICKNESS OF COMPACTED BACKFILL HAS BEEN PLACED TO PROVIDE ADEQUATE PROTECTION.
  7. MATERIALS FOR BEDDING, HAUNCH AND SIDE ZONES SHALL COMPLY WITH THE RELEVANT REQUIREMENTS OF TABLE 3 & 4 OF AS3725 FOR HS3 SUPPORT CONDITIONS.
  8. BEDDING AND BACKFILL MATERIAL TO BE PLACED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATION.
  9. UNSUITABLE IN SITU BEDDING MATERIAL SHALL BE TREATED IN ACCORDANCE WITH THE SPECIFICATION.
  10. CONTRACTOR TO EXERCISE EXTREME CARE IN THE VICINITY OF THE U/GROUND POWER, TELSTRA CONDUITS AND FIBRE OPTIC CABLES.
  11. PITS ARE NOT DRAWN TO SCALE.

LEGEND

- PROJECT BOUNDARY
- EXISTING DRAINAGE PIPE
- EXISTING DRAINAGE PIT
- EXISTING PIPE TO BE REMOVED
- PROPOSED DRAINAGE PIPE
- PROPOSED DRAINAGE MANHOLE
- PROPOSED SIDE ENTRY PIT
- PROPOSED HEADWALL
- PROPOSED MAJOR CONTOUR (1.0m INTERVALS)
- PROPOSED MINOR CONTOUR (0.1m INTERVALS)
- DRAINAGE STRUCTURE NUMBER  
J = LOT CONNECTION PIT, M = MANHOLE, S = SIDE ENTRY PIT, G = GULLY PIT

UPSTREAM PIPE INVERT LEVEL  
PIPE DIA(mm)/GRADE/LENGTH(m)  
DOWNSTREAM PIPE INVERT LEVEL

SERVICES LEGEND

EXISTING	PROPOSED	
--W--	W	WATER MAIN
	F	FEEDER PIPE
	W	WATER (MAINS EXTENSION)
--S--	S	SEWER
--RM--	RM	SEWER RISING MAIN
--G--	G	HIGH PRESSURE GAS PIPE
--UG--		POWER (UNDERGROUND)
--HV--	HV	POWER (HV UNDERGROUND)
--T--	T	TELSTRA CABLES
--COMM--	COMM	COMMUNICATIONS CONDUIT
		ELECTRICAL PIT (ACO P66 OR SIM.)
		COMMS PIT (ACO P66 OR SIM.)

TABLE 1

STRUCTURE TYPE	PIT DEPTH
BEN	1800-3600
DEN	3600-7200
TEN	600-1200
SEN	1200-3600

TABLE 1B

LINER Ø	MAX. Ø PIPE CONNECTING TO LINER	CONVERSION SLAB
NOM. Ø900	NOM. Ø450	NOT REQUIRED
NOM. Ø1050	NOM. Ø525	NOT REQUIRED
NOM. Ø1200	NOM. Ø600	NOT REQUIRED
NOM. Ø1500	NOM. Ø750	TYPE T3
NOM. Ø1800	NOM. Ø900	TYPE T2
NOM. Ø2250	NOM. Ø1050	TYPE T1

REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
A	20.03.2015	ISSUED FOR 50% REVIEW	AP				
REVISIONS				REVISIONS			

CLIENT  
**JANDAKOT AIRPORT HOLDINGS PTY. LTD.**

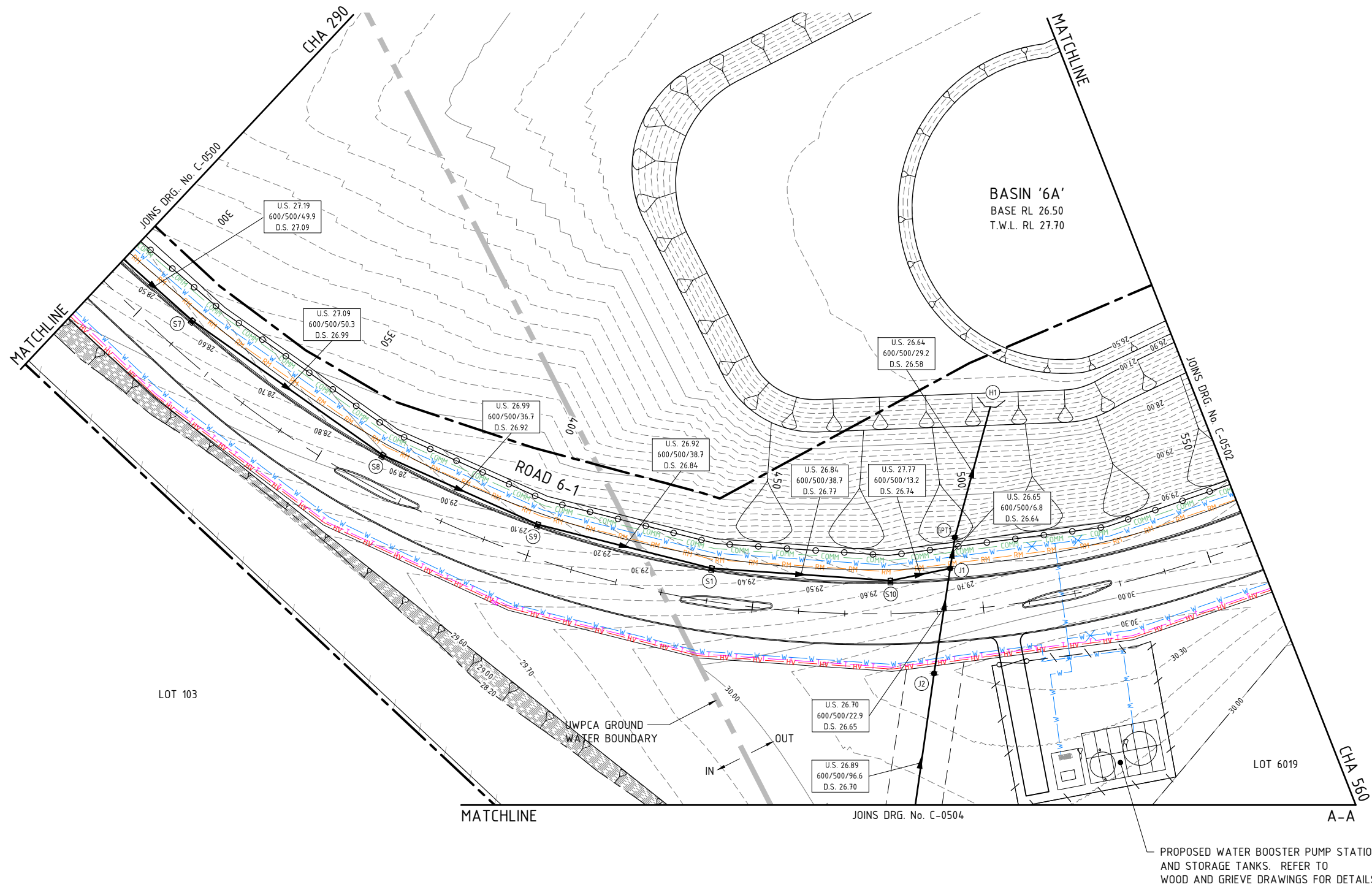
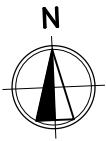
Perth Office—  
484 Murray St, Perth WA 6000  
P/+61 8 6364 3300  
E / info@bgeeng.com  
bgeeng.com—

**BG & E**

PROJECT  
**JANDAKOT AIRPORT REDEVELOPMENT PRECINCT 6**

STATUS ISSUED FOR INFORMATION NOT TO BE USED FOR CONSTRUCTION			
DRAWN SP	DESIGNED LF	CHECKED	APPROVED
DATUM AHD	GRID PCG94	SCALE 1:500	AT A1 SIZE

TITLE DRAINAGE PLAN CHA 0 TO CHA 290 SHEET 1		
PROJECT No. P14327	DRAWING No. C-0500	REV A



## NOTES

1. REFER TO DRG. No. C-0001 FOR OTHER DRAWINGS IN THIS SET.
2. REFER TO MAIN ROAD STANDARD DRAWINGS 200231-091 AND 200231-093 FOR SIDE ENTRY PITS.
3. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ACCURATELY LOCATE ALL SERVICES AND CARRY OUT ANY SERVICE PROTECTION WORKS DEEMED NECESSARY PRIOR TO WORK COMMENCING ON SITE.
5. ALL PIPES SHALL BE SPIGOT AND SOCKET TYPE WITH RUBBER RING JOINTS, RCP CLASS 2 UNLESS OTHERWISE NOTE.
6. CONSTRUCTION PLANT SHALL NOT BE PERMITTED TO TRAVEL OVER COMPACTED PIPELINE UNTIL A MINIMUM THICKNESS OF COMPACTED BACKFILL HAS BEEN PLACED TO PROVIDE ADEQUATE PROTECTION.
7. MATERIALS FOR BEDDING, HAUNCH AND SIDE ZONES SHALL COMPLY WITH THE RELEVANT REQUIREMENTS OF TABLE 3 & 4 OF AS3725 FOR HS3 SUPPORT CONDITIONS.
8. BEDDING AND BACKFILL MATERIAL TO BE PLACED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATION.
9. UNSUITABLE IN SITU BEDDING MATERIAL SHALL BE TREATED IN ACCORDANCE WITH THE SPECIFICATION.
10. CONTRACTOR TO EXERCISE EXTREME CARE IN THE VICINITY OF THE U/GROUND POWER, TELSTRA CONDUITS AND FIBRE OPTIC CABLES.
11. PITS ARE NOT DRAWN TO SCALE.

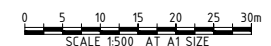
## LEGEND

- PROJECT BOUNDARY
- EXISTING DRAINAGE PIPE
- EXISTING DRAINAGE PIT
- EXISTING PIPE TO BE REMOVED
- PROPOSED DRAINAGE PIPE
- PROPOSED DRAINAGE MANHOLE
- PROPOSED SIDE ENTRY PIT
- PROPOSED HEADWALL
- PROPOSED MAJOR CONTOUR (1.0m INTERVALS)
- PROPOSED MINOR CONTOUR (0.1m INTERVALS)
- DRAINAGE STRUCTURE NUMBER  
J = LOT CONNECTION PIT, M = MANHOLE, S = SIDE ENTRY PIT, G = GULLY PIT

U.S. 12.42	UPSTREAM PIPE INVERT LEVEL
300/100/12.00	PIPE DIA(mm)/GRADE/LENGTH(m)
D.S. 12.30	DOWNSTREAM PIPE INVERT LEVEL

## SERVICES LEGEND

- | EXISTING | PROPOSED |                                  |
|----------|----------|----------------------------------|
| --W--W-- | W        | WATER MAIN                       |
|          | F        | FEEDER PIPE                      |
|          | W        | WATER (MAINS EXTENSION)          |
| --S--S-- | S        | SEWER                            |
| --RM--   | RM       | SEWER RISING MAIN                |
| --G--G-- | G        | HIGH PRESSURE GAS PIPE           |
| --UG--   |          | POWER (UNDERGROUND)              |
| --HV--   | HV       | POWER (HV UNDERGROUND)           |
| --T--T-- | T        | TELSTRA CABLES                   |
| --COMM-- | COMM     | COMMUNICATIONS CONDUIT           |
|          |          | ELECTRICAL PIT (ACO P66 OR SIM.) |
|          |          | COMMS PIT (ACO P66 OR SIM.)      |



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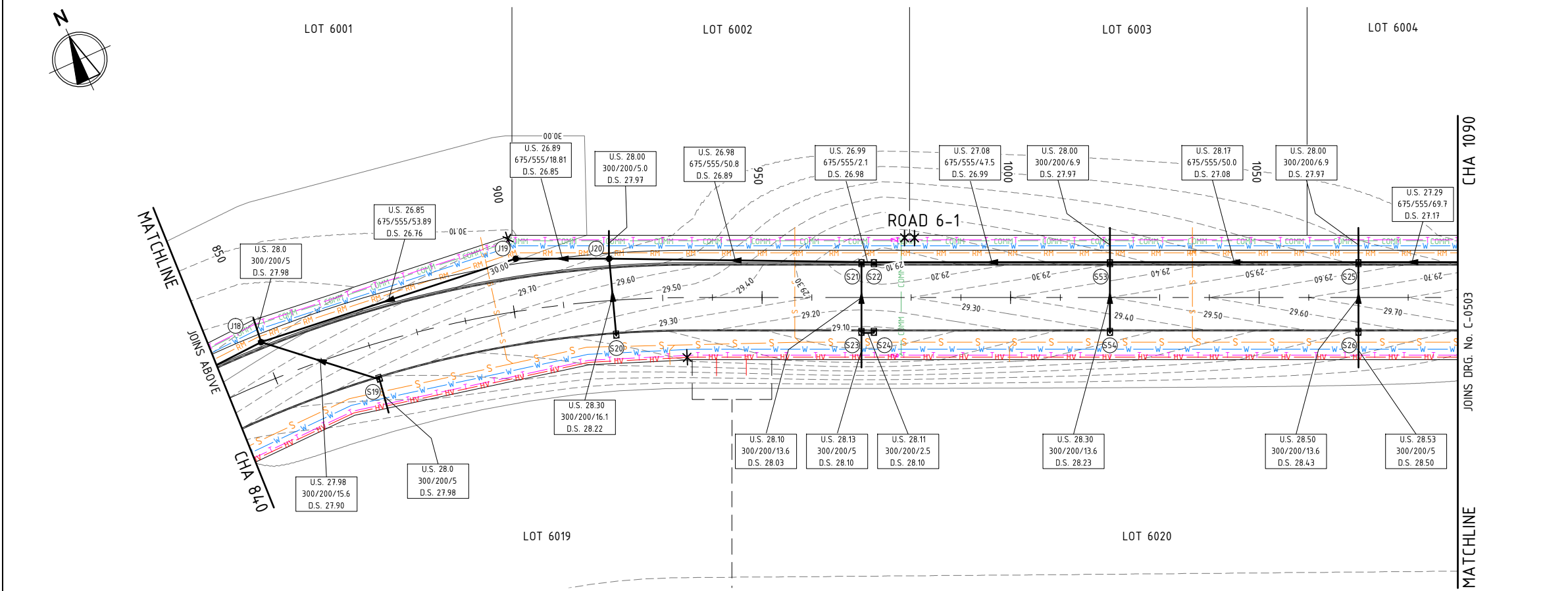
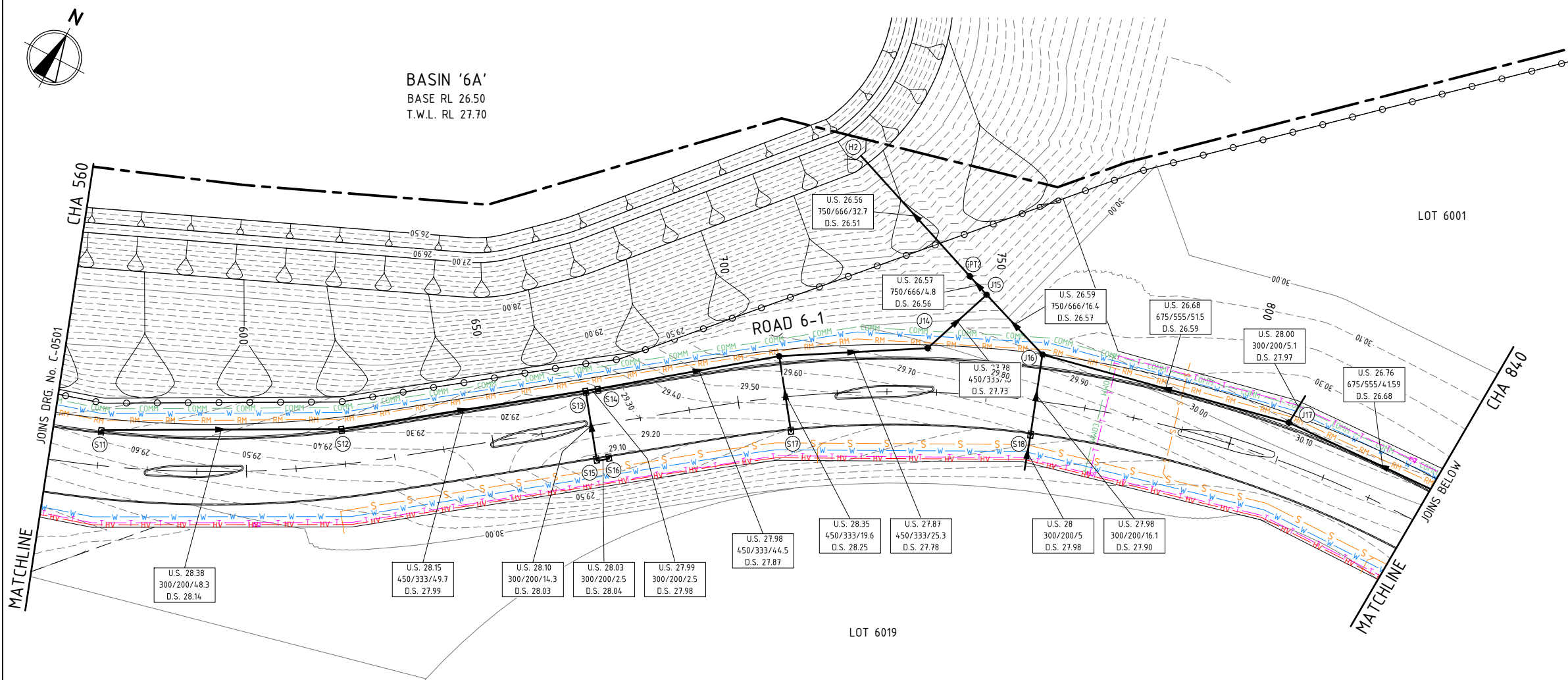
Perth Office—  
484 Murray St, Perth WA 6000  
P/+61 8 6364 3300  
E / info@bgeeng.com  
bgeeng.com—



JANDAKOT AIRPORT  
REDEVELOPMENT  
PRECINCT 6

ISSUED FOR INFORMATION NOT TO BE USED FOR CONSTRUCTION			
DRAWN	DESIGNED	CHECKED	APPROVED
SP	LF		
DATUM	GRID	SCALE	AT A1 SIZE
AHD	PCG94	1:500	

DRAINAGE PLAN CHA 0 TO CHA 290 SHEET 1		
PROJECT No.	DRAWING No.	REV
P14327	C-0500	A



- ### NOTES
- REFER TO DRG. No. C-0001 FOR OTHER DRAWINGS IN THIS SET.
  - REFER TO MAIN ROAD STANDARD DRAWINGS 200231-091 AND 200231-093 FOR SIDE ENTRY PITS.
  - ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
  - IT IS THE CONTRACTOR'S RESPONSIBILITY TO ACCURATELY LOCATE ALL SERVICES AND CARRY OUT ANY SERVICE PROTECTION WORKS DEEMED NECESSARY PRIOR TO WORK COMMENCING ON SITE.
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  - PITS ARE NOT DRAWN TO SCALE.

- ### LEGEND
- PROJECT BOUNDARY
  - EXISTING DRAINAGE PIPE
  - EXISTING DRAINAGE PIT
  - EXISTING PIPE TO BE REMOVED
  - PROPOSED DRAINAGE PIPE
  - PROPOSED DRAINAGE MANHOLE
  - PROPOSED SIDE ENTRY PIT
  - PROPOSED HEADWALL
  - PROPOSED MAJOR CONTOUR (1.0m INTERVALS)
  - PROPOSED MINOR CONTOUR (0.1m INTERVALS)
  - DRAINAGE STRUCTURE NUMBER  
J = LOT CONNECTION PIT, M = MANHOLE, S = SIDE ENTRY PIT, G = GULLY PIT

U.S. 12.42 300/100/12.00 D.S. 12.30	UPSTREAM PIPE INVERT LEVEL PIPE DIA(mm)/GRADE/LENGTH(m) DOWNSTREAM PIPE INVERT LEVEL
---	--

- ### SERVICES LEGEND
- | EXISTING | PROPOSED |                                  |
|----------|----------|----------------------------------|
| ---      | ---      | WATER MAIN                       |
| ---      | ---      | FEEDER PIPE                      |
| ---      | ---      | WATER (MAINS EXTENSION)          |
| ---      | ---      | SEWER                            |
| ---      | ---      | SEWER RISING MAIN                |
| ---      | ---      | HIGH PRESSURE GAS PIPE           |
| ---      | ---      | POWER (UNDERGROUND)              |
| ---      | ---      | POWER (HV UNDERGROUND)           |
| ---      | ---      | TELSTRA CABLES                   |
| ---      | ---      | COMMUNICATIONS CONDUIT           |
| ---      | ---      | ELECTRICAL PIT (ACO P66 OR SIM.) |
| ---      | ---      | COMMS PIT (ACO P66 OR SIM.)      |



REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION
A	20.03.2015	ISSUED FOR 50% REVIEW	AP		
REVISIONS					

REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION
REVISIONS					

CLIENT  
**JANDAKOT AIRPORT HOLDINGS PTY. LTD.**

Perth Office—  
484 Murray St, Perth WA 6000  
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bgeeng.com—

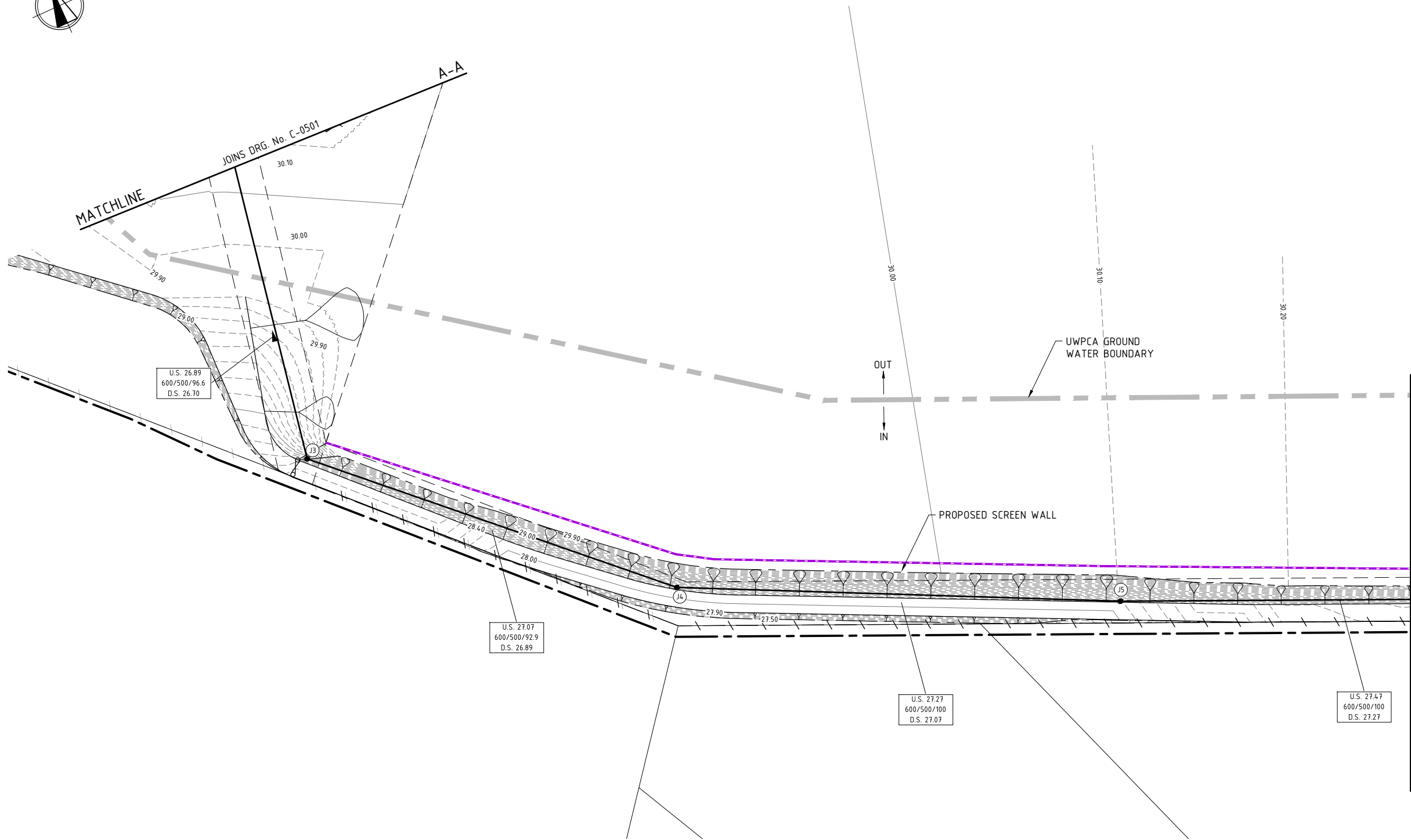
**BG & E**

PROJECT  
**JANDAKOT AIRPORT REDEVELOPMENT PRECINCT 6**

STATUS			
ISSUED FOR INFORMATION NOT TO BE USED FOR CONSTRUCTION			
DRAWN SP	DESIGNED LF	CHECKED	APPROVED
DATUM AHD	GRID PCG94	SCALE 1:500	AT A1 SIZE

TITLE		
DRAINAGE PLAN CHA 560 TO CHA 1090 SHEET 3		
PROJECT No. P14327	DRAWING No. C-0502	REV A





## NOTES

1. REFER TO DRG. No. C-0001 FOR OTHER DRAWINGS IN THIS SET.
2. REFER TO MAIN ROAD STANDARD DRAWINGS 200231-091 AND 200231-093 FOR SIDE ENTRY PITS.
3. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
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11. PITS ARE NOT DRAWN TO SCALE.

## LEGEND

- PROJECT BOUNDARY
- EXISTING DRAINAGE PIPE
- EXISTING DRAINAGE PIT
- EXISTING PIPE TO BE REMOVED
- PROPOSED DRAINAGE PIPE
- PROPOSED DRAINAGE MANHOLE
- PROPOSED SIDE ENTRY PIT
- PROPOSED HEADWALL
- PROPOSED MAJOR CONTOUR (1.0m INTERVALS)
- PROPOSED MINOR CONTOUR (0.1m INTERVALS)

DRAINAGE STRUCTURE NUMBER  
J = LOT CONNECTION PIT, M = MANHOLE,  
S = SIDE ENTRY PIT, G = GULLY PIT

U.S. 12.42 UPSTREAM PIPE INVERT LEVEL  
300/100/12.00 PIPE DIA(mm)/GRADE/LENGTH(m)  
D.S. 12.30 DOWNSTREAM PIPE INVERT LEVEL

## SERVICES LEGEND

- | EXISTING | PROPOSED       |                                  |
|----------|----------------|----------------------------------|
| --W--W-- | W-W-W          | WATER MAIN                       |
|          | F-F-F          | FEEDER PIPE                      |
|          | W-W-W          | WATER (MAINS EXTENSION)          |
| --S--S-- | S-S-S          | SEWER                            |
| --RM--   | RM-RM-RM       | SEWER RISING MAIN                |
| --G--G-- | G-G-G          | HIGH PRESSURE GAS PIPE           |
| --UG--   |                | POWER (UNDERGROUND)              |
| --HV--   | HV-HV-HV       | POWER (HV UNDERGROUND)           |
| --T--T-- | T-T-T          | TELSTRA CABLES                   |
| --COMM-- | COMM-COMM-COMM | COMMUNICATIONS CONDUIT           |
|          |                | ELECTRICAL PIT (ACO P66 OR SIM.) |
|          |                | COMMS PIT (ACO P66 OR SIM.)      |



0 5 10 15 20 25 30m  
SCALE 1:500 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
A	20.02.2015	ISSUED FOR 50% REVIEW	AP				
REVISIONS				REVISIONS			

JANDAKOT AIRPORT HOLDINGS  
PTY. LTD.

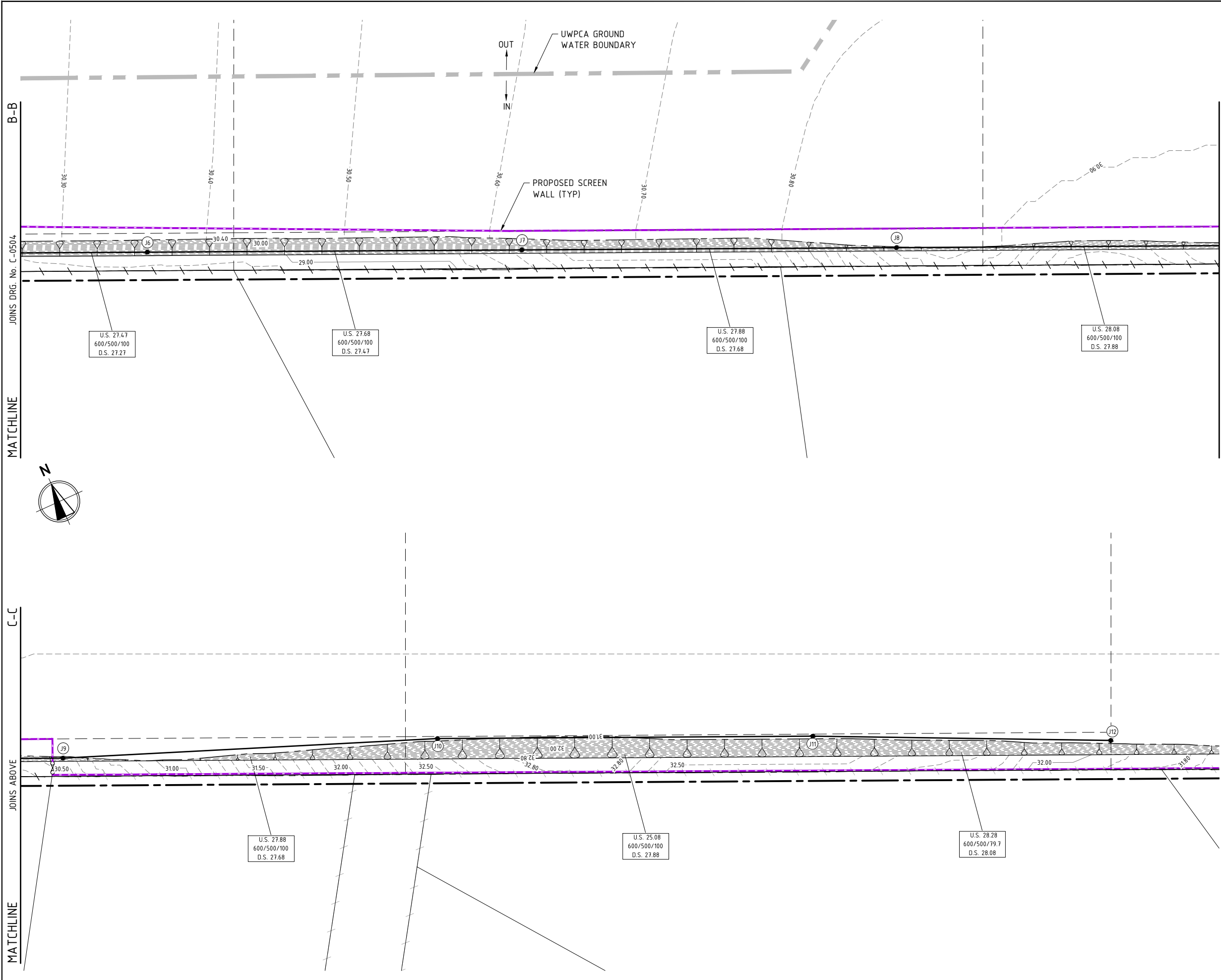
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bgeeng.com—



JANDAKOT AIRPORT  
REDEVELOPMENT  
PRECINCT 6

ISSUED FOR INFORMATION NOT TO BE USED FOR CONSTRUCTION			
DRAWN SP	DESIGNED LF	CHECKED	APPROVED
DATUM AHD	GRID PCG94	SCALE 1:500	AT A1 SIZE

DRAINAGE PLAN SHEET 5		
PROJECT No. P14327	DRAWING No. C-0504	REV A

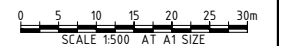


- ### NOTES
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  - ALL PIPES SHALL BE SPIGOT AND SOCKET TYPE WITH RUBBER RING JOINTS, RCP CLASS 2 UNLESS OTHERWISE NOTE.
  - CONSTRUCTION PLANT SHALL NOT BE PERMITTED TO TRAVEL OVER COMPACTED PIPELINE UNTIL A MINIMUM THICKNESS OF COMPACTED BACKFILL HAS BEEN PLACED TO PROVIDE ADEQUATE PROTECTION.
  - MATERIALS FOR BEDDING, HAUNCH AND SIDE ZONES SHALL COMPLY WITH THE RELEVANT REQUIREMENTS OF TABLE 3 & 4 OF AS3725 FOR HS3 SUPPORT CONDITIONS.
  - BEDDING AND BACKFILL MATERIAL TO BE PLACED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATION.
  - UNSUITABLE IN SITU BEDDING MATERIAL SHALL BE TREATED IN ACCORDANCE WITH THE SPECIFICATION.
  - CONTRACTOR TO EXERCISE EXTREME CARE IN THE VICINITY OF THE U/GROUND POWER, TELSTRA CONDUITS AND FIBRE OPTIC CABLES.
  - PITS ARE NOT DRAWN TO SCALE.

- ### LEGEND
- PROJECT BOUNDARY
  - EXISTING DRAINAGE PIPE
  - EXISTING DRAINAGE PIT
  - EXISTING PIPE TO BE REMOVED
  - PROPOSED DRAINAGE PIPE
  - PROPOSED DRAINAGE MANHOLE
  - PROPOSED SIDE ENTRY PIT
  - PROPOSED HEADWALL
  - PROPOSED MAJOR CONTOUR (1.0m INTERVALS)
  - PROPOSED MINOR CONTOUR (0.1m INTERVALS)
  - DRAINAGE STRUCTURE NUMBER  
J = LOT CONNECTION PIT, M = MANHOLE,  
S = SIDE ENTRY PIT, G = GULLY PIT

U.S. 12.42 300/100/12.00 D.S. 12.30	UPSTREAM PIPE INVERT LEVEL PIPE DIA(mm)/GRADE/LENGTH(m) DOWNSTREAM PIPE INVERT LEVEL
---	--

- ### SERVICES LEGEND
- | EXISTING | PROPOSED       |                                  |
|----------|----------------|----------------------------------|
| --W--W-- | W-W-W          | WATER MAIN                       |
|          | F-F-F          | FEEDER PIPE                      |
|          | W-W-W          | WATER (MAINS EXTENSION)          |
| --S--S-- | S-S-S          | SEWER                            |
| --RM--   | RM-RM-RM       | SEWER RISING MAIN                |
| --G--G-- | G-G-G          | HIGH PRESSURE GAS PIPE           |
| --UG--   |                | POWER (UNDERGROUND)              |
| --HV--   | HV-HV-HV       | POWER (HV UNDERGROUND)           |
| --T--T-- | T-T-T          | TELSTRA CABLES                   |
| --COMM-- | COMM-COMM-COMM | COMMUNICATIONS CONDUIT           |
|          |                | ELECTRICAL PIT (ACO P66 OR SIM.) |
|          |                | COMMS PIT (ACO P66 OR SIM.)      |



REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
A	20.03.2015	ISSUED FOR 50% REVIEW	AP				
REVISIONS				REVISIONS			

CLIENT  
**JANDAKOT AIRPORT HOLDINGS PTY. LTD.**

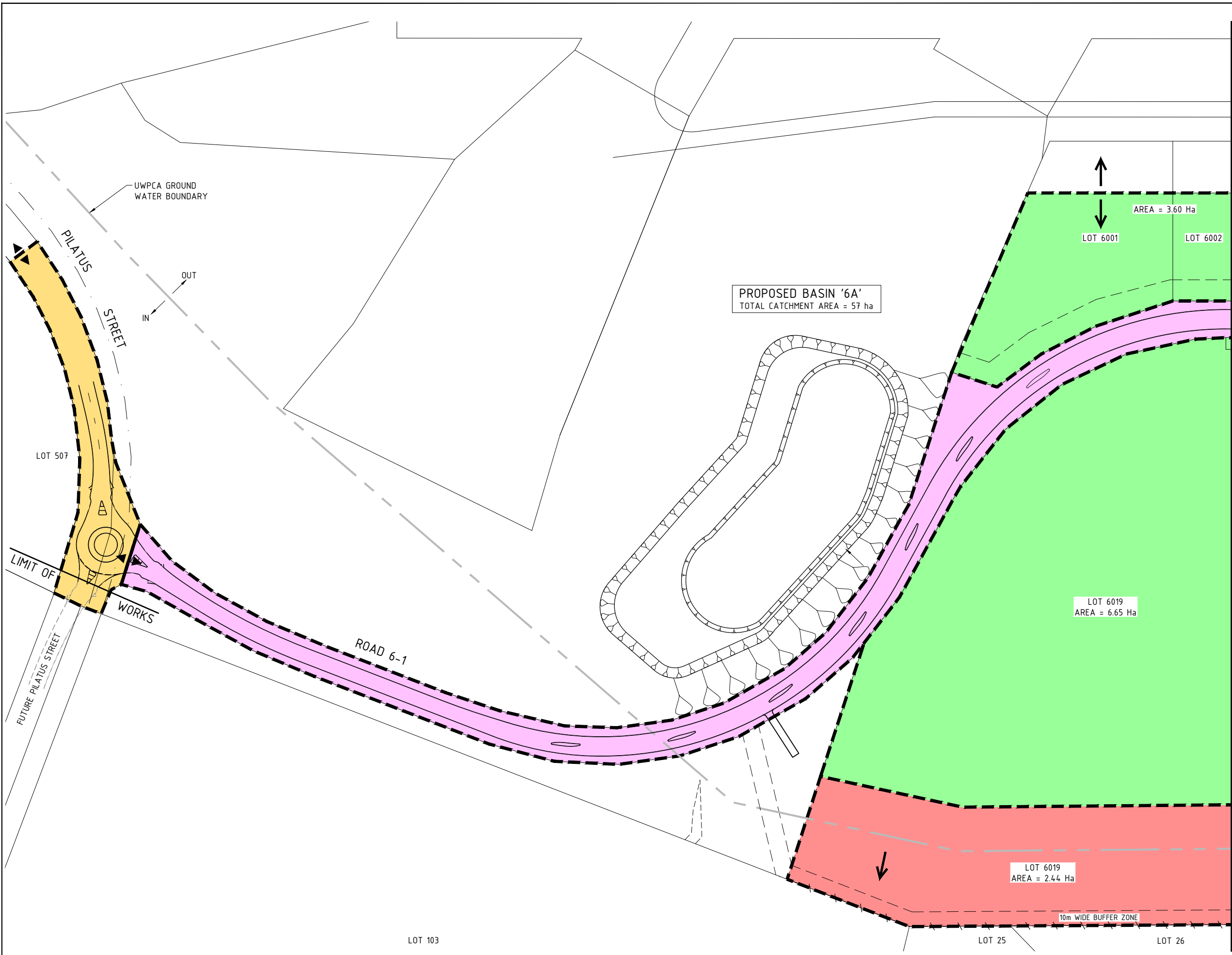
Perth Office—  
484 Murray St, Perth WA 6000  
P / +61 8 6364 3300  
E / info@bgeeng.com  
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**BG & E**

PROJECT  
**JANDAKOT AIRPORT REDEVELOPMENT PRECINCT 6**

STATUS			
ISSUED FOR INFORMATION NOT TO BE USED FOR CONSTRUCTION			
DRAWN SP	DESIGNED LF	CHECKED	APPROVED
DATUM AHD	GRID PCG94	SCALE 1:500	AT A1 SIZE

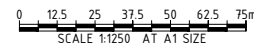
TITLE		
DRAINAGE PLAN SHEET 6		
PROJECT No. P14327	DRAWING No. C-0505	REV A



- NOTES**
1. REFER TO DRG No. C-0001 FOR OTHER DRAWINGS IN THIS SET.
  2. ALL LOTS TO STORE 150m<sup>3</sup> / Ha.
- LEGEND**
- PRECINCT 5 CATCHMENT  
AREA = 0.68 Ha
  - LOT CATCHMENTS OUTSIDE UWPCA  
GROUND WATER BOUNDARY  
AREA = 16.29 Ha
  - LOT CATCHMENTS INSIDE UWPCA  
GROUND WATER BOUNDARY  
AREA = 32.38 Ha
  - ROAD RESERVE CATCHMENT  
AREA = 4.45 Ha
- TOTAL CONTRIBUTING AREA : 38.6 Ha
- EQUIVALENT IMPERVIAS AREA : 20.2 Ha
- LOTS OUTSIDE UPWCA TO RETAIN ALL STORMWATER ONSITE. NO CONNECTION TO STORMWATER DRAINAGE PIT AND PIT SYSTEM

JOINS DRG No. C-0516

MATCHLINE



REVISIONS				REVISIONS			
REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
A	31.03.2015	ISSUED FOR 50% REVIEW	AP				

CLIENT

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Perth Office—  
484 Murray St, Perth WA 6000  
P / +61 8 6364 3300  
E / info@bgeeng.com  
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**BG  
&E**

PROJECT

JANDAKOT AIRPORT  
REDEVELOPMENT  
PRECINCT 6

STATUS			
ISSUED FOR INFORMATION NOT TO BE USED FOR CONSTRUCTION			
DRAWN SP	DESIGNED AH	CHECKED	APPROVED
DATUM AHD	GRID PCG94	SCALE 1:1250	AT A1 SIZE

TITLE			
DRAINAGE CATCHMENT PLAN BASIN '6A' - SHEET 1			
PROJECT No. P14327	DRAWING No. C-0515	REV A	

A-A

JOINS DRG No. C-0515

MATCHLINE

UWPCA GROUND WATER  
BOUNDARY

OUT

IN

AREA = 3.60 Ha

AREA = 3.53 Ha

ROAD 6-1

LOT 6021

LOT 6020  
AREA = 6.04 Ha

LOT 6012  
AREA = 4.48 Ha

LOT 6015  
AREA = 4.99 Ha

LOT 6018  
AREA = 5.51 Ha

LOT 6020  
AREA = 1.95 Ha

LOT 6012  
AREA = 2.23 Ha

LOT 6015  
AREA = 2.49 Ha

LOT 6018  
AREA = 2.8 Ha

10m WIDE BUFFER ZONE

LOT 27

LOT 28

LOT 29

SOLOMON  
ROAD

LOT 4

LOT 5

NOTES

1. REFER TO DRG No. C-0001 FOR OTHER DRAWINGS IN THIS SET.
2. ALL LOTS TO STORE 150m<sup>3</sup> / Ha.

LEGEND

- PRECINCT 5 CATCHMENT  
AREA = 0.68 Ha
- LOT CATCHMENTS OUTSIDE UWPCA  
GROUND WATER BOUNDARY  
AREA = 16.29 Ha
- LOT CATCHMENTS INSIDE UWPCA  
GROUND WATER BOUNDARY  
AREA = 32.38 Ha
- ROAD RESERVE CATCHMENT  
AREA = 4.45 Ha

TOTAL CONTRIBUTING AREA : 38.6 Ha

EQUIVALENT IMPERVIAS AREA : 20.2 Ha

LOTS OUTSIDE UWPCA TO RETAIN ALL  
STORMWATER ONSITE. NO CONNECTION TO  
STORMWATER DRAINAGE PIT AND PIT SYSTEM

FUTURE PUMPED FLOW FROM AREA TO  
THE EAST. DEVELOPMENT TO EAST TO  
ALLOW MIN. 2 HOUR STORAGE PRIOR TO  
PUMPING INTO PRECINCT 6 CATCHMENT

0 12.5 25 37.5 50 62.5 75m  
SCALE 1:1250 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD	REV	DATE	DESCRIPTION	RVD
A	20.03.2015	ISSUED FOR 50% REVIEW	AP				
REVISIONS				REVISIONS			

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PTY. LTD.

Perth Office—  
484 Murray St, Perth WA 6000  
P/+61 8 6364 3300  
E / info@bgeeng.com  
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JANDAKOT AIRPORT  
REDEVELOPMENT  
PRECINCT 6

STATUS			
ISSUED FOR INFORMATION NOT TO BE USED FOR CONSTRUCTION			
DRAWN SP	DESIGNED AH	CHECKED	APPROVED
DATUM AHD	GRID PCG94	SCALE 1:1250	AT A1 SIZE

TITLE		
DRAINAGE CATCHMENT PLAN BASIN '6A' - SHEET 2		
PROJECT No. P14327	DRAWING No. C-0516	REV A

## APPENDIX 3: LWMS CHECKLIST

Local water management strategy Item	Deliverable	☑	Comments
<b>Executive summary</b>			
Summary of the development design strategy, outlining how the design objectives are proposed to be met	Table 1: Design elements & requirements for BMPs and critical control points	☑	
<b>Introduction</b>			
Total water cycle management – principles & objectives Planning background Previous studies		☑	
<b>Proposed development</b>			
Structure plan, zoning and land use. Key landscape features Previous land use	Site context plan Structure plan	☑ n/a	
Landscape - proposed POS areas, POS credits, water source, bore(s), lake details (if applicable)	Landscape Plan	n/a	
<b>Design criteria</b>			
Agreed design objectives		☑	
<b>Pre-development environment</b>			
Existing information and more detailed assessments (monitoring). How do the site characteristics affect the design?		☑	
Site Conditions - existing topography/ contours, aerial photo underlay, major physical features	Site condition plan	☑	
Geotechnical - topography, soils including acid sulphate soils and infiltration capacity, test pit locations	Geotechnical plan	☑	
Environmental - areas of significant vegetation, wetlands and buffers, waterways and buffers, contaminated sites	Environmental Plan plus supporting data where appropriate	☑	
Surface Water – topography, 100 year floodways and flood fringe areas, water quality of flows entering and leaving (if applicable)	Surface Water Plan	☑	
Groundwater – topography, pre development groundwater levels and water quality, test bore locations	Groundwater Plan plus details of groundwater monitoring and testing	☑	
<b>Water sustainability initiatives</b>			
Water supply & efficiency measures – private and public open spaces		☑	
Fit-for-purpose strategy and agreed actions. If non-potable supply, support with water balance		☑	
Wastewater management		☑	
<b>Stormwater management strategy</b>			
Flood protection - peak flow rates, volumes and top water levels at control points, 100 year flow paths and 100 year detentions storage areas	100yr event Plan Long section of critical points	n/a	
Manage serviceability - storage and retention required for the critical 5 year ARI storm events Minor roads should be passable in the 5 year ARI event	5yr event Plan	n/a	

Local water management strategy Item	Deliverable	<input checked="" type="checkbox"/>	Comments
Protect ecology – detention areas for the 1 yr 1 hr ARI event, areas for water quality treatment and types of (including indicative locations for) agreed structural and non-structural best management practices and treatment trains. Protection of waterways, wetlands (and their buffers), remnant vegetation and ecological linkages	1yr event Plan Typical cross sections	n/a	
<b>Groundwater management strategy</b>			
Post development groundwater levels and fill requirements (including existing and likely final surface levels), outlet controls, and any subsoils	Groundwater/subsoil Plan	n/a	
Actions to address acid sulfate soils or contamination		<input checked="" type="checkbox"/>	
<b>The next stage – subdivision and urban water management plans</b>			
Content and coverage of future urban water management plans to be completed at subdivision. Include areas where further investigations are required prior to detailed design.		n/a	
<b>Monitoring</b>			
Recommended future monitoring plan including timing, frequency, locations and parameters, together with arrangements for ongoing actions		<input checked="" type="checkbox"/>	
<b>Implementation</b>			
Developer commitments		<input checked="" type="checkbox"/>	
Roles, responsibilities, funding for implementation		<input checked="" type="checkbox"/>	
Review		<input checked="" type="checkbox"/>	



**Client: Jandakot Airport Holdings Pty Ltd**

Report	Version	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
Preliminary draft	V1	HBr/RM		electronic	18/02/15
Draft for consultation	V2	HBr	SSh	electronic	27/02/15
Final report	V3	HBr	SSh	electronic	05/05/15
Revised final report	V4	HBr		electronic	05/05/15

**Essential Environmental**

*land & water solutions*

622 Newcastle St Leederville 6007

p: 08 9328 4663 | f: 08 6316 1431

e: [info@essentialenvironmental.com.au](mailto:info@essentialenvironmental.com.au)

[www.essentialenvironmental.com.au](http://www.essentialenvironmental.com.au)