JANDAKOT AIRPORT

GROUNDWATER MANAGEMENT PLAN

Jandakot Airport Holdings Pty Ltd
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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. The airport covers an area of approximately 622 ha which has been developed over a period of more than 50 years. 119 ha are designated Conservation Precincts within Master Plan 2014 (JAH 2014a).

Jandakot Airport has a responsibility to aviation business and the community to ensure that infrastructure including the construction and widening of runways, taxiways and aprons is in place to meet aviation demand and ensure the safety, efficiency and regularity of aviation and other traffic on and around the Airport. In 2008/2009 the Airport undertook extensive consultation and obtained approval of the Jandakot Airport Master Plan 2009 (JAH 2009) for Runway and Taxiway upgrades and a commercial development precinct.

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) approval 2009/4796 was granted in March 2010 for the clearing of vegetation in accordance with the Jandakot Airport Master Plan 2009 (Figure 1) and the Jandakot Airport Offset Plan (JAH 2014b). Conditions of approval were later amended and approved by the Department of the Environment and Energy (DoEE) in April 2014 (refer Appendix A and Figure 2).

EPBC Act approval 2013/7032 (refer to Appendix A) was granted in July 2014. This approval allowed for the clearing and development of Precincts 6 and 6A, as detailed in Master Plan 2014 (Figure 3).

This Groundwater Management Plan (GMP) has been developed in accordance with Condition 7 of EPBC 2009/4796 and Condition 2 of EPBC 2013/7032, which required the GMP to include:

- Groundwater Monitoring and Reporting (EPBC 2009/4796 and EPBC 2013/7032)
- Provision of groundwater monitoring reports to the WA Department of Water and Environment Regulation (DWER) and Water Corporation (EPBC 2009/4796 and EPBC 2013/7032)
- Address all relevant measures included in the Local Water Management Strategy (EPBC 2009/4796)
- A water management strategy, specifically designed for Precincts 6 and 6A (EPBC 2013/7032)
- Schedules for the independent audit of groundwater monitoring results and reports (EPBC 2009/4796 and EPBC 2013/7032)
- Spill avoidance, management and rehabilitation measures and procedures (EPBC 2009/4796 and EPBC 2013/7032)
- The introduction of a sewage system (EPBC 2009/4796 and EPBC 2013/7032)
- Acceptable development types (EPBC 2013/7032).

The purpose of the GMP is to detail the groundwater management and monitoring measures required at Jandakot Airport in order to protect the Jandakot Groundwater Mound (specifically the Priority 1 Source Protection Area) from the development and subsequent operation of Precincts 5, 6 and 6A.

2 LEGISLATIVE REQUIREMENTS

The key pieces of legislation controlling the environment operations of the Airport are the *Airports Act 1996*, *Airports (Environment Protection) Regulations 1997* and the *Environment Protection and Biodiversity Conservation Act 1999.*

2.1 Airports Act 1996

The *Airports Act 1996* requires the operator of an airport to prepare an Airport Master Plan (which includes an Environment Strategy) every five years. This GMP complements the approved Jandakot Airport Master Plan 2014.

2.2 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.

2.3 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.

2.4 State Legislation

Some State environmental 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 (i.e. waste management). Where State and Commonwealth legislation conflicts, Commonwealth legislation take precedence.

3 LINKS TO OTHER MANAGEMENT STRATEGIES AND PLANS

3.1 Local Water Management Strategy

JAH have developed a Local Water Management Strategy (LWMS), in consultation with the WA DWER, taking due cognisance of water reticulation, irrigation, sewage effluent disposal and wastewater reuse (Essential Environmental 2015). The LWMS incorporates and provides for the implementation of Water Sensitive Urban Design (WSUD) at the airport.

The LWMS identifies water management objectives for the site that have been developed with consideration of site specific issues and 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 Jandakot Underground Water Pollution Control Area (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.

JAH is committed to adopting and implementing all relevant measures of the LWMS which is included as Appendix B of this GWP.

3.2 Aerodrome Emergency Plan

The Aerodrome Emergency Plan (AEP) has been developed to ensure effective and efficient arrangements for the response to, and recovery from, an emergency at Jandakot Airport. This includes emergency response plans and procedures for potentially polluting events such as 'fuel and oil spills' and 'hazardous materials' consistent with the LWMS and GMP. The AEP is focused on emergencies associated with aerodrome operations, and JAH typically takes on a facilitation role, allowing emergency services personnel to respond as appropriate. Whilst JAH maintains some on-site capability to respond to spills, there is no central emergency response or spill control team based at the airport. Spill response (and subsequent remediation) is therefore the responsibility of the relevant tenant or contractor, as detailed within the relevant tenant OEMP or CEMP.

3.3 Construction Environmental Management Plans, Demolition Environmental Management Plans and Operational Environmental Management Plans

Jandakot Airport tenants are responsible for managing their own operations in an environmentally responsible manner consistent with the approved Jandakot Airport Master Plan and conditions of lease. JAH has developed guidelines and templates to assist tenants in the development of Operational Environmental Management Plans (OEMPs). The requirement for a tenant OEMP is directly linked to a tenant's environmental risk profile.

All construction/civil works (including demolition) with the potential for environmental impacts require a Construction Environmental Management Plan (CEMP), which must be reviewed and endorsed by the JAH Environmental Management team prior to works

commencing. The requirement for CEMPs is typically included as a condition of the building/works/demolition permit issued by the Department of Infrastructure, Regional Development and Cities (DIRDC).

Clearing and construction activities associated with EPBC approved projects are undertaken in accordance with relevant CEMPs (as required by the conditions of approval) which must be approved by the Minister for the Environment.

3.4 Tenant resources

Jandakot Airport Holdings (JAH) maintains a suite of Tenant Resources containing relevant groundwater and contamination control information, consistent with the LWMS and GMP, on the JAH website; including:

- Tenant Environmental Handbook
- Management of Sewage and Greywater Policy
- Dangerous Goods and Hazardous Materials Policy
- Aircraft and Equipment Washdown Policy
- Storage of Empty Drums and Containers Policy.

3.5 Spill Avoidance and Management Procedures

The documents referenced in section 3.3 and 3.4 above contain numerous spill avoidance and management procedures applicable to the various activities that occur on the airport.

EPBC clearing and civil construction activities are managed via the CEMP which includes a Hazardous Materials Management Plan and Environmental Emergency Response Procedures. Examples of specific spill avoidance measures include:

- Provide a contractor spill control plan to JAH EM
- Ensure fully stocked spill kit is available on refuelling truck(s) and (if applicable) in the vicinity of hazardous material storage area(s)
- Provide a designated bunded storage area
- Containers holding hazardous substances will be labelled and stored upright with lids closed on bunds in designated areas when not in use.

Similarly, CEMP and OEMP templates applicable to lot-level constructions and subsequent operations are consistent with Master Plan 2014 and the various policies detailed in section 3.4 above and provide guidance on the content required within an approved CEMP or tenant OEMP. Examples of applicable spill avoidance mitigation measures include:

- Liquid chemicals, including hydrocarbons, of a volume 205L (44 gallons) or greater, must be stored within impervious bunding designed to contain 110% of the volume of the largest storage vessel (e.g. self bunded spill pallet)
- If the storage area is not located in a covered area, bunding must have the capacity to allow for heavy rainfall events, preferably with overhead protection to restrict the entry of water
- Suitably designed drip trays or other containment must be used for volumes less than 205L
- Appropriate licensing must be obtained where required under legislation (e.g. Dangerous Goods Licence)
- A spill kit that is appropriate for the volume and type of substances stored must be kept on site.

4 DESCRIPTION OF THE DEVELOPMENT AND AREA

4.1 Acceptable Development

The majority of Precinct 5 and approximately half of Precinct 6 and 6A are within in the Jandakot Groundwater Mound Area (see Figure 4). It has been ascertained by the inclusion of non-structural and structural storm water controls and risk assessments that Precincts 5, 6 and 6A can be developed without posing additional risks to water resources (CyMod 2009a, Essential Environmental 2015).

Precinct 5 provides a mixed business use in a park-like setting which allows for uses appropriate to the JUWPCA and is responsive to its interface with rural-residential neighbours bordering the western boundary of the Airport. It will support warehouse, manufacturing and storage type development and land uses that will be generally consistent with the City of Cockburn's 'Mixed Business' zone from the City of Cockburn's Town Planning Scheme No. 3 (TPS 3). Uses will be responsive to the JUWPCA and potential pollutants will be minimised and managed by ensuring:

- Bulk storage (manifest quantities as defined under the *Dangerous Goods Safety Act 2004* and associated regulations), of potentially polluting dangerous goods, chemicals etc. within the Priority 1 Source Protection Area of the Jandakot Underground Water Pollution Control Area is not permitted.
- Minor chemical storage, consistent with the approved uses at the site, will be permitted only if managed under an approved Operational Environmental Management Plan that requires all chemicals to be managed in accordance with relevant Australian Standards.

Similar to Precinct 5, the objective of Precincts 6 is to provide a mixed use business park-like setting and to provide uses appropriate for the JUWPCA (for the eastern half of the Precinct). Precinct 6 will support office, business, professional services, warehouse, manufacturing and storage type development and land uses that will be generally consistent with the City of Cockburn's 'Mixed Business' zone. Precinct 6A will be developed for uses that seek to capitalise on access to the new taxiway system within Precinct 3 as part of the future fourth runway and associated airfield augmentation, and will include aviation activity and aviation support facilities.

Ultimately, any proposed development on land cleared under EPBC 2009/4796 and EPBC 2013/7032 is approved by DIRDC under the *Airports Act 1996* and associated regulations, taking into account the current approved Master Plan and other relevant factors.

4.2 Soils and Geology

The Armadale and Fremantle 1:50 000 Environmental Geology Series indicates Jandakot Airport consists of Quaternary superficial alluvial sediments, varying in thickness from around 30 m to 60 m. The sands unconformably overlay the older Osborne and Leederville formations, comprising of shale and siltstones.

The Swan Coastal Plain consists of a series of distinct dune systems aligned approximately north to south and extending from the coast to the Darling Scarp. The Quindalup and Spearwood dune systems lie closest to the coast, with the Bassendean dune system further to the east. Jandakot Airport lies approximately 3 km east of the Spearwood system boundary, within the Bassendean dune system. Bassendean sands are Aeolian, or windborne, soils derived from particles washed up by the ocean and blown by wind to form dunes. These sands are characterised as pale grey, white, medium grained, moderately sorted quartz sand with black heavy minerals scattered throughout.

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.

4.2.1 Acid Sulfate Soils

Acid sulfate soil (ASS) is the common name for soils that contain metal sulfides. In an undisturbed and waterlogged state, these soils may pose no or low risk. However, when acid sulfate soils are disturbed or exposed and react with oxygen, they produce sulfuric acid which may be accompanied by certain hazards. Metals may be released from sediments and become bioavailable in the environment, oxygen may be removed from the water column and gases such as hydrogen sulfide, sulfur dioxide and methane may be released.

Failure to appropriately manage acid sulfate soils may:

- Impact the quality of potable groundwater due to acidification and release of metals in acid sulfate soil areas and receiving waters
- Impact the quality of groundwater extracted for non-potable purposes (i.e. irrigation)
- Impact infrastructure and the built environment by subsidence and corrosion.

According to DWER (DWER-055)) the majority of the site is located in an area of moderate to low risk of ASS occurring within 3m of the natural soil surface but high to moderate risk of ASS beyond 3 m of the natural soil surface (i.e. Class 2). A small area of land in the south of the airport is categorised as 'high to moderate risk of ASS occurring within 3m of the natural soil surface' (i.e. Class 1) (see Figure 5).

4.3 Wetlands

Within Jandakot Airport there are no natural drainage channels or defined areas of surface water.

The two wetlands that occur on the airport are both Resource Enhancement category wetlands (Damplands) as defined by the Geomorphic Wetlands of the Swan Coastal Plain dataset (DBCA-019). These are located in Precincts 1A and 2A of Master Plan 2014, both of which are designated conservation areas.

4.4 Stormwater and Drainage

Development, which increases the area of impermeable surfaces such as buildings, roads, car parks, runways and apron areas, will concentrate run-off following very intense rainfall events.

Drainage swales and basins have been created in strategic areas of the airport to collect run-off from roads and other sealed surfaces. Due to the high permeability of the Bassendean soils, run-off is localised and short term as it generally infiltrates very quickly. Water retention and ponding within drainage swales and basins is avoided where possible in order to deter water birds that may pose a bird strike risk to aircraft operations.

In general, stormwater throughout the proposed development will be managed via a combination of soakwells, open drains and swales complimented by an underground pipe drainage network. The soakwells, open drains and swales aim to maximise local infiltration i.e. recharge to the ground water system. All proposed non-aviation development will be consistent with the Jandakot City Leasing and Development Guidelines and will maintain on site attenuation of up to the 1:20 year storm event without onsite ponding through the use of soakwells or small infiltration areas within their respective lots. Onsite drainage will also attenuate and store up to the 1:100 year event. Larger storm events may result in discharge into the road reserves, swales and drainage basins.

4.5 Sewerage

Reticulated sewerage, linked to the local municipal sewer system, has been connected to Jandakot Airport. This system currently services all new and planned future developments within Precincts 4,5 and 6/6A as well as some of the established aviation areas of the airport. The sewer is a reticulated gravity system to the main internal pump station which is connected via a pressure main to the Bibra Lake main sewer.

Older, established areas of the airport will be progressively linked to sewer in coming years, and progress is reported annually within the Jandakot Airport Annual Environment Report. 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 DIRDC Airport Building Controller (ABC).

4.6 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.

The Jandakot Mound is a shallow sand aquifer covers an approximate area of 760 km2, from the Swan River in the north to the Serpentine River in the south. The Jandakot Mound developed because the rate of infiltration exceeds the rate of horizontal groundwater flow through the aquifer.

Jandakot Airport is partially located on the northern margin of the Jandakot Mound, with the crest of the mound located south of the airport (Davidson 1995).

4.6.1 Jandakot Underground Water Pollution Control Area

The Jandakot Mound is gazetted as both a Public Drinking Water Supply Area (PDWSA) and an Underground Water Pollution Control Area (UWPCA). The JUWPCA defines the area of the Jandakot Mound groundwater system that provides public water supply as part of the Integrated Water Supply Scheme. The DWER manages Western Australia's water resources including the Jandakot Mound and restricts land uses that may pose a threat to the quantity or quality of water available from the mound for public water supply.

Within the JUWPCA, a three-level priority system is used (see Figure 4). The priority classifications are determined by land tenure, land use and water flow patterns (WAPC 2003). Each priority classification is subject to the following management objectives:

- Priority 1 (P1) classification areas are managed to ensure that there is no degradation of the drinking water source by preventing the development of potentially harmful activities in these areas. The guiding principle is risk avoidance. This is the most stringent priority classification for drinking water sources. P1 areas normally encompass land owned or managed by State agencies, but may include private land that is strategically significant to the protection of the drinking water source (e.g. land immediately adjacent to a reservoir).
- Priority 2 (P2) classification areas are managed to ensure that there is no increased risk of water source contamination/pollution. For P2 areas, the guiding principle is risk minimisation. These areas include established low-risk land development (e.g. low intensity rural activity).
- Priority 3 (P3) classification areas are defined to manage the risk of pollution to the water source from catchment activities. Protection of P3 areas is mainly achieved through guided or regulated environmental (risk) management for land use activities. P3 areas are declared over land where water supply sources coexist with other land uses such as residential, commercial and light industrial development (DoE (WA) 2004).

In addition to the three Priority Classification Areas, specific protection zones are defined to protect drinking water sources from contamination in the immediate vicinity of water extraction facilities. Within these zones by-laws may prohibit, restrict or approve defined land uses and activities to prevent water source contamination or pollution. Wellhead protection zones (WHPZ) are used to protect underground sources of drinking water. They are circular with a radius of 300 – 500 m.

Portions of the airport land are within the P1 Source Protection Area of the JUWPCA, including:

- Conservation Precincts 2A, 2B and a portion of 1B
- Portions of Precinct 4 and 5, which are already under development
- Precinct 3, including existing infrastructure and portions of the proposed fourth runway and runway extension
- The eastern and southern portions of Precinct 6/6A.

Other land uses in close proximity to the airport include:

- A Western Power development north of Jandakot Airport is currently being used as a warehousing and transport depot. This facility is located within the P1 area and partially straddles a wellhead protection zone.
- Development to the west of the airport includes rural residential, residential and a golf course. Parts of these developments straddle wellhead protection zones. Residential and golf courses are sources of nutrients through the application of fertilizers.
- A large industrial subdivision north of Armadale Road partly over a wellhead protection zone.
- A retail development at the junction of Berrigan Drive and Jandakot Road is within a wellhead protection zone.
- Substantial portions of the Kwinana Freeway are not only within the JUWPCA boundary but over wellhead protection zones.

There are a number of production wells (Figure 6) and observation bores (Figure 7) in proximity to Jandakot Airport.

There are no wellhead protection zones within or near Precincts 5 and 6/6A; the closest is at the Glen Iris golf course approximately 800 m to the west of the airport boundary.

Existing and future developments at the airport that are located within the JUWPCA are managed in accordance with this GMP.

4.6.2 Groundwater Flow Direction and Levels

Groundwater was previously reported to drain across Jandakot Airport in a north-westerly direction. Ongoing monitoring indicated that groundwater flow was in a northerly direction over most of the airport and in a north-westerly direction in precinct 5 (Essential Environmental 2017). Following the inclusion of supplementary bores during 2017/18 monitoring, it is evident that there is a ridge of higher groundwater that runs from south to north across the site, with groundwater sloping downwards towards the north-east and north-west from the centre (Urbaqua 2018). Groundwater flow directions were both very similar in September 2017 and March 2018 with groundwater elevations roughly 0.5 m lower across the site in March (Figure 8).

Groundwater levels at Jandakot Airport are generally shallow (22 to 26 m AHD, see Figure 9) with little variability in the groundwater levels throughout the year. Monitoring (to March 2018) shows that groundwater levels generally rise between June and September in response to infiltration from rainfall followed by a recession from September to June, with the seasonal difference typically being less than 2 m.

A review of historical DWER data shows that groundwater levels in the Jandakot area have receded markedly over the last 35 to 40 years. However, similar to observations at Jandakot Airport, groundwater levels are slightly higher than in previous years (Figure 10).

4.6.3 Local Groundwater Abstraction

JAH recognises that sound management of groundwater abstraction is essential to ensure that the water resources are available to all consumers, including Jandakot Airport.

JAH abstracts groundwater for irrigation and construction (primarily dust suppression during construction) purposes via a network of abstraction bores (see Figure 11).

4.6.4 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 monitoring program in December 2013. The following are summary observations based on the available monitoring data:

- In situ measurement of pH values of groundwater range from 3.1 to 6.6, indicating acidic conditions
- Levels in exceedance of *Airports (Environment Protection) Regulations 1997* triggers for total nitrogen were recorded across all 11 bores with similar results for total phosphorous
- With the exception of aluminium, zinc and iron, detected concentrations of metals and arsenic are generally 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 CO2 production and root respiration in the soil in such environments. Appelo and Postma (2005) identified the lowest pH from CO2 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 (FeS2). 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 ATU's. Minor fertilising of the airfield grassed areas and phosphite treatment of dieback occasionally occurs 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_{16}-C_{34} 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_{16}-C_{34}).

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.

4.6.5 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 2009a, 2009b) 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 2009a, 2009b).

5 GROUNDWATER MANAGEMENT

5.1 Acid Sulfate Soil and Dewatering Management

The WA Department of Water and Environment Regulation (DWER) has released an Acid Sulfate Soils Guideline Series containing the following:

- Identification and investigation of acid sulfate soils and acidic landscapes (DER 2015a).
- Treatment and management of soils and water in acid sulfate soil landscapes (DER 2015b).

Consistent with the DWER guidelines, sites will be investigated for acid sulfate soils if any of the following are proposed:

- Soil or sediment disturbance of 100 m3 or in areas depicted in an ASS risk map as Class 1
- Soil or sediment disturbance of 100 m3 or more with excavation from below the natural water table in an area depicted on an ASS risk map as Class 2
- 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 m below the natural surface. Any construction activity expected to require temporary or permanent dewatering will trigger consideration and investigation of acid sulfate soils.

In line with the *Airports (Building Control) Regulations 1996* and the Jandakot Airport/City Leasing and Development Guidelines, both JAH and the DIRDC review the scope and design of development works prior to any building/works permits being issued. This allows potential triggers to be identified and for building/works permits to be appropriately conditioned regarding ASS management.

If the initial investigation confirms the presence of ASS, an ASS Management Plan, consistent with the DWER Acid Sulfate Soils Guideline Series and including dewatering management if required, will be developed and implemented.

5.2 Stormwater and Drainage Management

Within developments that overlay the JUWPCA, all stormwater collected from roof surfaces, with the exception of that which may be diverted to rainwater tanks, is discharged directly to soakwells within each lease boundary via downpipes to facilitate and maximise groundwater recharge.

Stormwater from all roads, carparks and external hardstands within the Precinct 5 JUWPCA is discharged into a drainage basin(s) located outside of the JUWPCA. As discussed above, stormwater basins at the airport are not designed to pond and hold water for extended periods, as is the case in many bioretention designs, as the risk of attracting waterbirds is too great.

A risk management approach is being adopted in accordance with the LWMS for stormwater runoff from each land use present within the Airport addressed as follows:

- 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
- Stormwater runoff from low risk areas of roads and hardstand will be directed to drainage basins for infiltration

- Manage stormwater quality from higher risk areas through appropriate treatment devices such as interceptors and/or separators.

This approach will minimise the risk of significant contaminants entering the drainage system and subsequently being infiltrated via the basins. Where a basin is considered suitable, JAH may incorporate limited native sedges or other suitable vegetation into the basin design to provide additional nutrient stripping capability.

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 (DIRDC and DWER), it has been determined that monitoring groundwater at a location downgradient from the points of discharge/infiltration will be sufficient to detect any impacts on groundwater quality. Monitoring bores (JAMB10 and JAMB 11) were installed in 2013 and have been incorporated into the groundwater monitoring program as described in Section 5.5 from December 2013. Following construction of the Precinct 6/6A stormwater infiltration basin it was 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.

5.3 Sewage and Wash Water Management

All new developments within Precincts 4, 5 and 6/6A (i.e. Jandakot City) will be connected to reticulated sewerage as detailed within Master Plan 2014.

When a sewer connection is provided to a leased site, all wash water must be captured and either:

- Collected and disposed of by a licensed liquid waste management contractor; or
- Treated and discharged to the sewer under the conditions of a “Permit to Discharge Industrial Waste” obtained from the WA Water Corporation.

5.4 Groundwater Abstraction Management

All groundwater abstraction bores are metered and water consumption rates are monitored monthly.

JAH has consulted with the WA DWER regarding management of groundwater resources and groundwater abstraction. All abstraction occurs under a conditioned licence issued by the DWER, and JAH provides DWER with Annual Reports detailing groundwater abstraction volumes and groundwater quality monitoring results.

5.5 Groundwater Monitoring Program

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.

5.5.1 Bore Location

Nine groundwater monitoring bores were installed at Jandakot Airport in February 2012 (Figure 8) at the locations proposed within the original approved GMP (V3, August 2011). Following consultation with the then DoW, a further two bores (JAMB10 and JAMB11) were installed in order to monitor groundwater quality downgradient to stormwater infiltration basins located to the east of the JUWPCA boundary in the eastern portion of Precinct 5.

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 (see Section 5.5.6).

5.5.2 Sampling Frequency

In order to establish baseline groundwater conditions, it is standard practice to undertake quarterly groundwater monitoring events (GMEs) for a two year period. Providing results do not indicate the presence of contamination (which would warrant additional investigation), sampling is typically reduced to biannual or annual GMEs.

JAMB1-JAMB9 were initially sampled quarterly for two years (i.e. a minimum of 8 sampling events). Essential Environmental reviewed the monitoring results and concurred with Coffey (2014) that there were no issues that warrant ongoing quarterly investigation. The data collected facilitated a review of assessment levels to adopt revised values for a number of analytes based on observed control sites. Ongoing biannual monitoring has since occurred (and will continue to occur) 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.

See also Section 5.5.6 Amendment of Groundwater Sampling Program.

5.5.3 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 1.

Under the *Airports (Environment 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 90th 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 90th percentile of collected groundwater data from ten monitoring events (March 2012 to

September 2014) 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 DIRDC, if warranted.

5.5.4 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 will be completed by laboratories which hold National Association of Testing Authorities (NATA) accreditation for the particular parameters and methodologies needed.

Table 1. Ground Water Assessment Levels.			
Parameter	**Unit**	**A(EP)R 1997 Schedule 2**	**Assessment Level**
On Site Field Measurements			
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
On site measurements are to be undertaken with appropriately calibrated equipment (certificates to be provided within AGMR)			
Laboratory Analysis			
Electrical Conductivity (EC)	µS/cm	n/a	120-480
Total Dissolved Solids	mg/L	<1000 or 5% increase	<1000 or 5% increase
Total Acidity (as $CaCo_3$)	mg/L	n/a	60
Net Acidity (T_{acid}-T_{alk} as $CaCo_3$)	mg/L	n/a	60
Chloride (Cl)	mg/L	n/a	250
Sulphate (SO_4)	mg/L	n/a	500
Hardness (as $CaCo_3$)	mg/L	n/a	n/a
Nutrients			
Phosphorus (P)	mg/L	0.01	0.12
Nitrogen (N)	mg/L	0.1	6.39
Heavy Metals			
Aluminium	mg/L	0.10	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	1.0	1.45
Lead	mg/L	0.001	0.003
Nickel	mg/L	0.015	0.015
Zinc	mg/L	0.005	0.019
Total Petroleum Hydrocarbons			
Fuel (C_6-C_9 fractions)	mg/L	0.15	0.15
Mineral Oil (>C_9 fractions)	mg/L	0.60	0.60
Monocyclic Aromatic Compounds			
Benzene	mg/L	0.30	<0.001
Toluene	mg/L	0.30	0.025
Ethybenzene	mg/L	0.14	0.003
Xylene	mg/L	n/a	0.02
Notes: Values in RED are assessment levels adopted based on the 90th percentile of collected groundwater data (March 2012 to September 2014) at observed control sites consistent with the recommendations of ARMCANZ & ANZECC 2000 Figures in BLUE are ADWG assessment levels specified by the WA DoH.			

5.5.5 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 necessary action can be agreed upon and implemented. As noted within Table 1, exceedances of A(EP)R triggers may occur regularly for certain parameters and does not necessarily constitute groundwater contamination.

Where an exceedance of an A(EP)R trigger is interpreted by the consultant as indicating the potential presence of contamination, JAH will advise the DIRDC 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. For example, exceedances and/or increasing levels of nutrients that cannot be attributed to background conditions of groundwater entering the site may warrant investigation into the location and rates of on-site fertiliser use.

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 Section 5.5 of 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 A(EP)R Schedule 2 and any other relevant regional data that is available from the DWER 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 the Key Stakeholders identified in Section 6 below.

5.5.6 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 (as defined in the Groundwater Monitoring Program) may occur at any time based on the recommendation of the groundwater consultant engaged to undertake the groundwater monitoring program.

Excluding changes describe above, 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 invited to comment on proposed changes prior to the GMP being

amended, approved and implemented consistent with Conditions 12 of EPBC 2009/4796 and Conditions 2 and 7 of EPBC 2013/7032.

5.5.7 Auditing

The Annual Groundwater Monitoring Reports are to be provided to key stakeholders and regulators annually (refer Sections 5.5.5 and 6), 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 2022. 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.

5.6 Incidents and Emergencies

JAH staff, tenants and contractors are required to report all environmental incidents to JAH for investigation. This includes all spills that have the potential to cause environmental harm (i.e. soil and/or groundwater contamination), regardless of volume.

All incidents are recorded within the JAH Safety Management System (SMS) and are subject to an initial assessment to determine if further investigation is required, and corrective actions are identified if warranted. For incidents resulting in potential contamination, corrective actions may include groundwater and/or soil sampling or the development and implementation of a remediation program.

Sites are inspected by JAH staff (or their consultants) for evidence of unreported spills during tenant audits, formal and informal site inspections and Environmental Site Assessments. Suspected spills are then reported and subsequently investigated as environmental incidents.

The Aerodrome Emergency Plan (AEP) has been developed to ensure effective and efficient arrangements for the response to, and recovery from, an emergency at Jandakot Airport. This includes emergency response plans for potentially polluting events such as ‘fuel and oil spills’ and ‘hazardous materials’.

In addition, Airport tenants who store chemicals or undertake activities that have the potential to result in environmental harm (including soil or groundwater contamination) are required to develop an Operational Environmental Management Plan that includes emergency response procedures. Similarly, contractors undertaking construction activities are required to develop Construction Environmental Management Plans that include emergency response procedures.

5.7 Contamination Management

All areas of confirmed or suspected contamination are reported and recorded on the JAH Contaminated Sites Register, which is a component of the Environmental Site Register. Sites are ranked according to the nature of contamination and risks posed. Where investigation identifies sites as requiring remediation or ongoing monitoring (as confirmed or instructed by the AEO), appropriate plans are developed and implemented in line with the *Airports (Environment Protection) Regulations 1997*, *National Environment Protection (Assessment of Site Contamination) Measure 1999* (ASC NEPM – as amended in 2013) and the DWER’s Contaminated Sites Management Series Guidelines as appropriate.

6 COMMUNICATION PLAN

6.1 Publication and Awareness

JAH communicates the contents of this Groundwater Management Plan via the following methods:

- Publication of the GMP on the JAH website where it is accessible to all staff, tenants, contractors and members of the public.
- Inclusion of relevant groundwater management information within CEMP and OEMP templates developed for contractor and tenant use.
- Inclusion of Oil Spill and Hazardous Materials Response Procedures within the Aerodrome Emergency Plan.
- The publication of Tenant Resources containing relevant groundwater and contamination control information on the JAH website; including:
    - Tenant Environmental Handbook
    - Management of Sewage and Greywater Policy
    - Dangerous Goods and Hazardous Materials Policy
    - Aircraft and Equipment Washdown Policy
    - Storage of Empty Drums and Containers Policy

6.2 Stakeholder Consultation

Stakeholder consultation is recognised as an important component of sound environment management practices.

Jandakot Airport holds regular internal consultation meetings as well as with government departments and other external stakeholders as required. Key Stakeholder consultation relevant to the GMP is summarised below:

Table 2. Key Stakeholder	**Timing**
Commonwealth Regulatory Authorities	
Department of Environment and Energy (DoEE)	As Required
Airport Environment Officer - Department of Infrastructure, Regional Development and Cities (AEO DIRDC)	Weekly
WA Government Agencies	
WA Department of Water and Environment Regulation (DWER)	As Required
WA Water Corporation	As Required

6.3 Reporting Requirements

Reporting against actions described in this plan will be included within the Jandakot Airport Annual Environment Report (AER). In line with the *Airports (Environment Protection) Regulations 1997*, the AER will be submitted to DIRDC by 28th October each year. A copy of the report will be provided to DoEE by 28th October each year.

Annual Groundwater Monitoring Reports (refer Section 5.5.5) will be distributed by 28th October each year to DoEE, DIRDC, DWER and the Water Corporation.

Reporting relevant to the GMP will also be included in an annual compliance report, as required under Condition 16 of EPBC 2009/4796, and published on the JAH website by 28th October each year.

7 IMPLEMENTATION

7.1 Review and Amendment of GMP

The GMP will require regular review and amendment in order to meet practical requirements on site as changing circumstances demand.

Once amended, the GMP will be submitted to DoEE for the Minister's approval (ref Conditions 7 and 12 of EPBC 2009/4796; Conditions 2 and 7 of EPBC 2013/7032). The approved management plan will be implemented.

Unless an earlier trigger arises, the GMP will be reviewed following the approval of Jandakot Airport Master Plan 2019 and any other associated approval(s) required for implementation of Master Plan 2019.

7.2 Summary of Actions

The Table below contains a list of summary actions relating to the GMP.

Table 3. Groundwater Management Plan Summary of Actions.			
Action		**Responsibility**	**Timing**
Acid Sulfate Soil Management			
GMP1	Investigate Acid Sulfate Soils in line with DWER guidelines and triggers.	JAH EM to facilitate the proponent/contractor undertaking the proposed action.	Prior to any action that triggers the requirement for investigation.
GMP2	Develop and implement an ASSMP consistent with the DWER Acid Sulfate Soils Guideline Series.	JAH EM to facilitate the proponent/contractor undertaking the proposed action.	If required (based on the findings of GMP1), ASSMP to be developed prior to undertaking any action that disturbs ASS as identified in an ASS Investigation.
Stormwater Management			
GMP3	Within the JUWPCA stormwater from roofs is collected and discharged into soakwells in order to facilitate and maximise groundwater recharge. NB. This excludes any roof water captured in approved rainwater tanks.	JAH EM	Ongoing
GMP4	Stormwater from all roads, carparks and external hardstands within the JUWPCA is discharged into a drainage basin(s) located outside of the JUWPCA with stormwater from higher risk areas having passed through appropriate treatment devices such as interceptors and/or separators when warranted.	JAH EM	Ongoing
Sewage Management			
GMP5	All new developments will be connected to reticulated sewer consistent with Master Plan 2014.	JAH EM	Ongoing
Groundwater Abstraction			
GMP6	Water abstraction is to be consistent with the licence issued by the DWER.	JAH EM	Ongoing
GMP7	Provide an annual groundwater abstraction report, containing abstraction volumes obtained from monthly meter readings, to the DWER.	JAH EM	28 October Annually from 2015.
Groundwater Monitoring Program			
GMP8	Undertake groundwater monitoring consistent with Section 5.5 of this GMP.	JAH EM and consultant engaged to undertake the task.	Quarterly for the first two years (from March 2012) and then biannual (or consistent with timing as determined in Section 5.5.6 if applicable).
GMP9	Exceedances of criteria interpreted by the consultant as representing potential contamination will be reported to JAH as soon as results become available.	Consultant engaged by JAH EM	Within 72 hours of results becoming available.
GMP10	GME results, in an interim report, will be	Consultant	Within 8 weeks of a GME unless

Table 3. Groundwater Management Plan Summary of Actions.			
Action		**Responsibility**	**Timing**
	provided by the consultant to JAH.	engaged by JAH EM	the draft Annual Report, is provided to the JAH Environment Manager within 8 weeks of the final GME of the Financial Year.
GMP11	An updated electronic database containing GME results will be provided by the consultant to JAH.	Consultant engaged by JAH EM	Within 8 weeks of a GME.
GMP12	Prepare an Annual Report, which details the results of monitoring undertaken as described within Section 5.5 of this plan.	Consultant engaged by JAH EM	28 October Annually
GMP13	Seek comment from key stakeholders regarding proposed changes in sampling frequency, suite of analytes or assessment levels as detailed in Section 5.5.6.	JAH EM	Prior to the GMP being amended and submitted for approval.
GMP14	Undertake an independent audit of the groundwater monitoring program.	JAH EM	Every 5 years (next due by the end of 2022).
Incidents and Emergencies			
GMP15	Incidents that have the potential to cause environmental harm are recorded in the JAH SMS. (Noting information regarding incidents is often initially reported/recorded in other formats (e.g. email) and relevant information transferred to the SMS at a later date. This does not cause delays in the initial assessment/response of an environmental incident).	All JAH staff, overseen by JAH EM.	ASAP after incident is reported.
GMP16	Reported incidents that have the potential to cause environmental harm are immediately reviewed by JAH Environmental staff and if required, further investigated and corrective actions assigned if necessary.	JAH EM in collaboration with the contractor/tenant responsible for the incident and the DIRDC AEO.	The timing of this action is dependent on the nature of the incident and associated risk (e.g. volume, location, potential impacts etc.).
GMP17	Incident Reporting Requirements are detailed within the Jandakot Airport Tenant Environmental Handbook which is to be made available on the JAH webpage along with an Environmental Incident Report form.	JAH	At all times.
GMP18	Ensure that all OEMPs and CEMPs include emergency response and incident reporting procedures.	JAH EM	Prior to endorsing any CEMP or OEMP.
Contamination Management			
GMP19	Record all areas of confirmed or suspected contamination on the Environmental Site Register's (ESR) Contaminated Sites Register (CSR).	JAH EM	Whilst the ESR CSR is updated regularly as required, the CSR is to be fully reviewed and updated with all relevant information by 28 October annually for inclusion within the AER.
GMP20	Investigate all reported/recorded incidents that have the potential to result in a contaminated site and (if required) determine any sampling, monitoring, remediation and validation requirements (noting in most instances, this action is the same as GMP16).	JAH EM in collaboration with the contractor/tenant responsible for the incident and the DIRDC AEO.	The timing of this action is dependent on the nature of the incident and associated risk (e.g. volume, location, potential impacts etc.).
GMP21	Develop and implement (as and if required) sampling, monitoring, remediation and	JAH	The timing of this action is dependent of the outcome of

Table 3. Groundwater Management Plan Summary of Actions.			
Action		**Responsibility**	**Timing**
	validation requirements as identified in above action consistent with the Regulations detailed in Section 5.7.		GMP20.
Communication and Awareness			
GMP22	Publish GMP on the JAH website.	JAH EM	Within 1 month of being approved by the Minister.
GMP23	Update the JAH CEMP and tenant OEMP templates with relevant groundwater management information (only required if information within current CEMP and OEMP templates is not consistent with the current GMP).	JAH EM	Within 3 months of GMP review completion and subsequent endorsement by relevant government regulator.
GMP24	Ensure all CEMPs and OEMPs submitted to JAH for review and endorsement adequately addresses Groundwater Management (i.e. groundwater protection and pollution prevention), relevant to the activities proposed to be undertaken.	JAH EM	Prior to endorsing CEMP or OEMP.
Reporting Requirements			
GMP25	Report against actions of the GMP within the Jandakot Airport Annual Environment Report (AER) and provide copies to DIRDC and DoEE	JAH EM	28 October Annually.
GMP26	Distribute Annual Monitoring Report to Key Stakeholders.	JAH EM	28 October Annually.
GMP27	Report against actions of the GMP within an Annual Compliance Report (ref Condition 16 of EPBC 2009/4796) and publish on the JAH website.	JAH EM	28 October Annually.
Review and Amendment of GMP			
GMP28	Undertake a full comprehensive review and amendment of GMP	JAH EM	Within 6 months of approval of Master Plan 2019 and any associated EPBC approvals, or as otherwise directed by DoEE.

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9 ABBREVIATIONS AND ACRONYMS

ABC	Airport Building Controller
AEO	Airport Environment Officer
AEP	Aerodrome Emergency Plan
AER	Annual Environment Report
ASS	Acid Sulfate Soils
ASSMP	Acid Sulfate Soil Management Plan
BMP	Best Management Practice
CALM	Department of Conservation and Land Management (now known as DBCA)
CEMP	Construction Environmental Management Plan
CMP	Conservation Management Plan
CSR	Contaminated Sites Register
DEC	Department of Environment and Conservation (formerly CALM). On 1 July 2013 the Department of Environment and Conservation separated into two agencies, the Department of Parks and Wildlife (DPAW – now DBCA) and the Department of Environment Regulation (DER – now DWER).
DER	Department of Environment Regulation (now DWER)
DEWHA	Department of Environment, Water, Heritage and the Arts (now DoEE)
DIRDC	Department of Infrastructure, Regional Development and Cities (previously DIRD and DIT)
DIT	Department of Infrastructure and Transport (now DIRDC)
DoE	Department of the Environment (now DoEE)
DoEE	Department of the Environment and Energy (previously DoE, DEWHA and DSEWPaC)
DoW	Department of Water (now DWER)
DPAW	Department of Parks and Wildlife (formerly DEC). On 1 July 2017 DPAW was merged with three other Departments to become DBCA.
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Previously DEWHA and now DoEE)
DWER	Department of Water and Environment Regulation
EMS	Environmental Management System
EPBC	Environmental Protection and Biodiversity Conservation Act 1999
ESR	Environmental Site Register
GME	Groundwater Monitoring Event
GMP	Groundwater Management Plan
JAH	Jandakot Airport Holdings
JUWPCA	Jandakot Underground Water Pollution Control Area
LWMS	Local Water Management Strategy
NATA	National Association of Testing Authorities
NES	National Environmental Significance
OEMP	Operational Environmental Management Plan
PDWSA	Public Drinking Water Supply Area
QA/QC	Quality Assurance/Quality Control
SMS	Safety Management System
UWPCA	Underground Water Pollution Control Area
WHPZ	Wellhead Protection Zone
WSUD	Water Sensitive Urban Design

FIGURE 1 MASTER PLAN 2009 PRECINCT PLAN

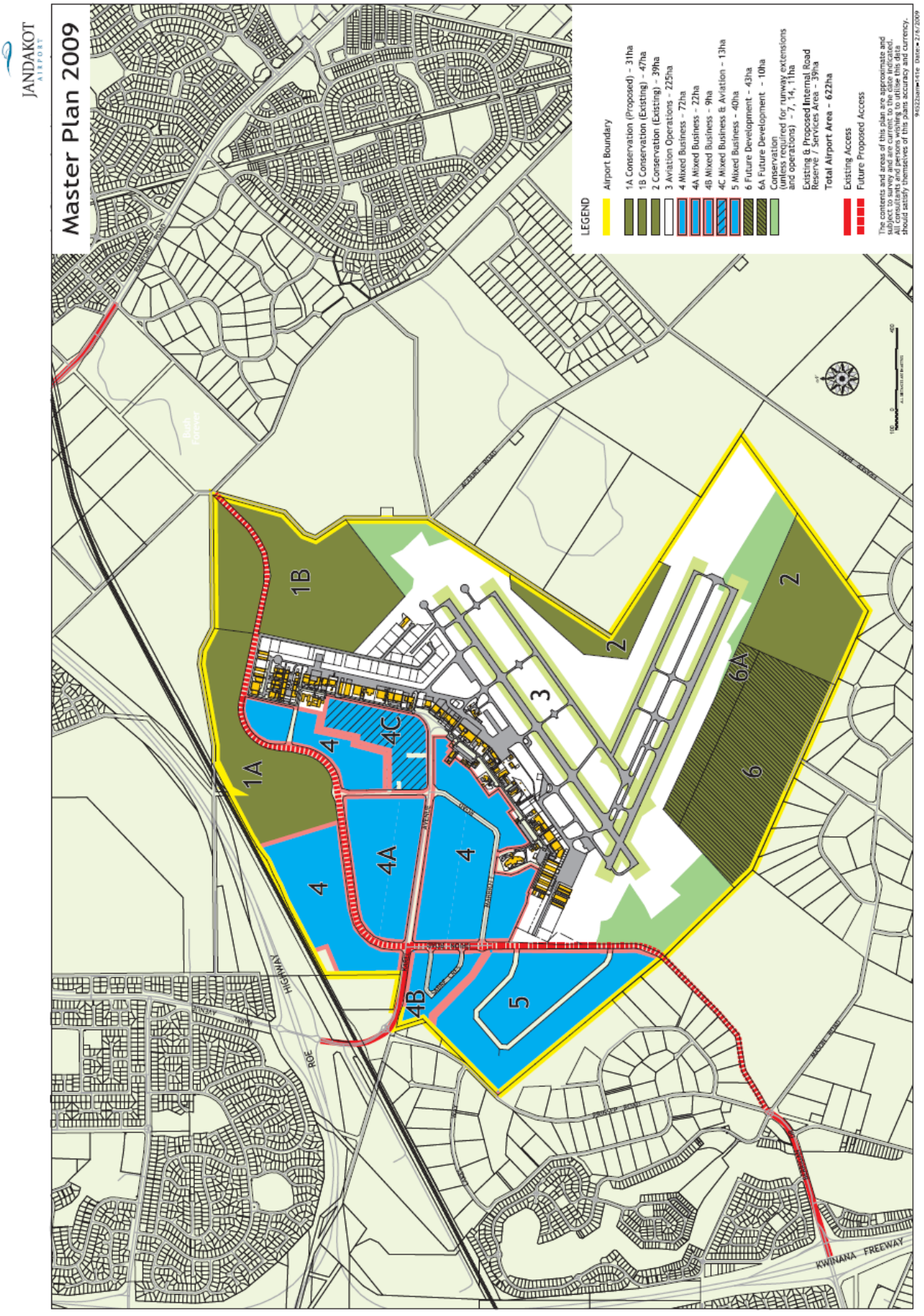

FIGURE 2 ANNEXURE A FROM EPBC 2009/4796

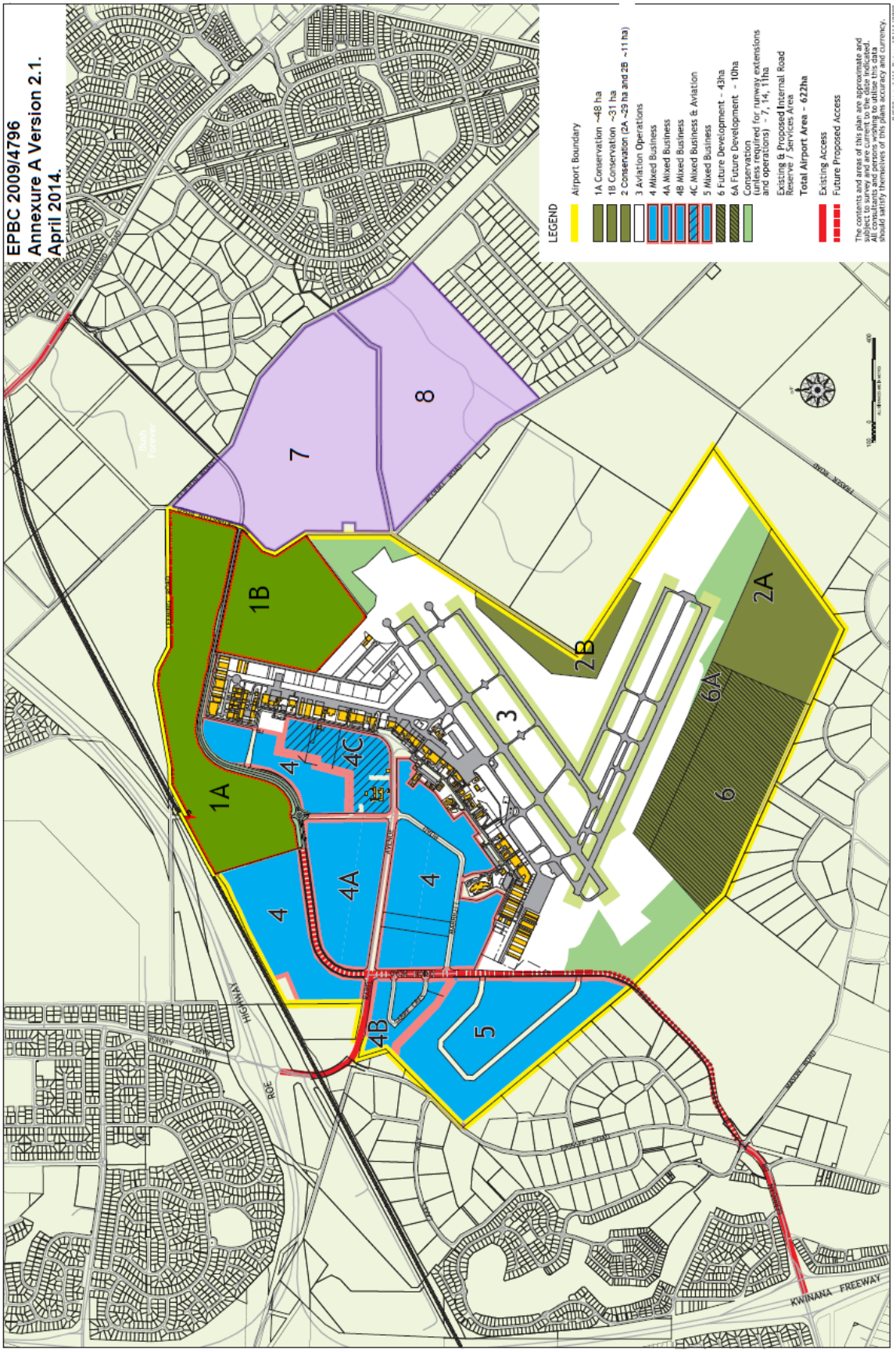

FIGURE 3 MASTER PLAN 2014 PRECINCT PLAN

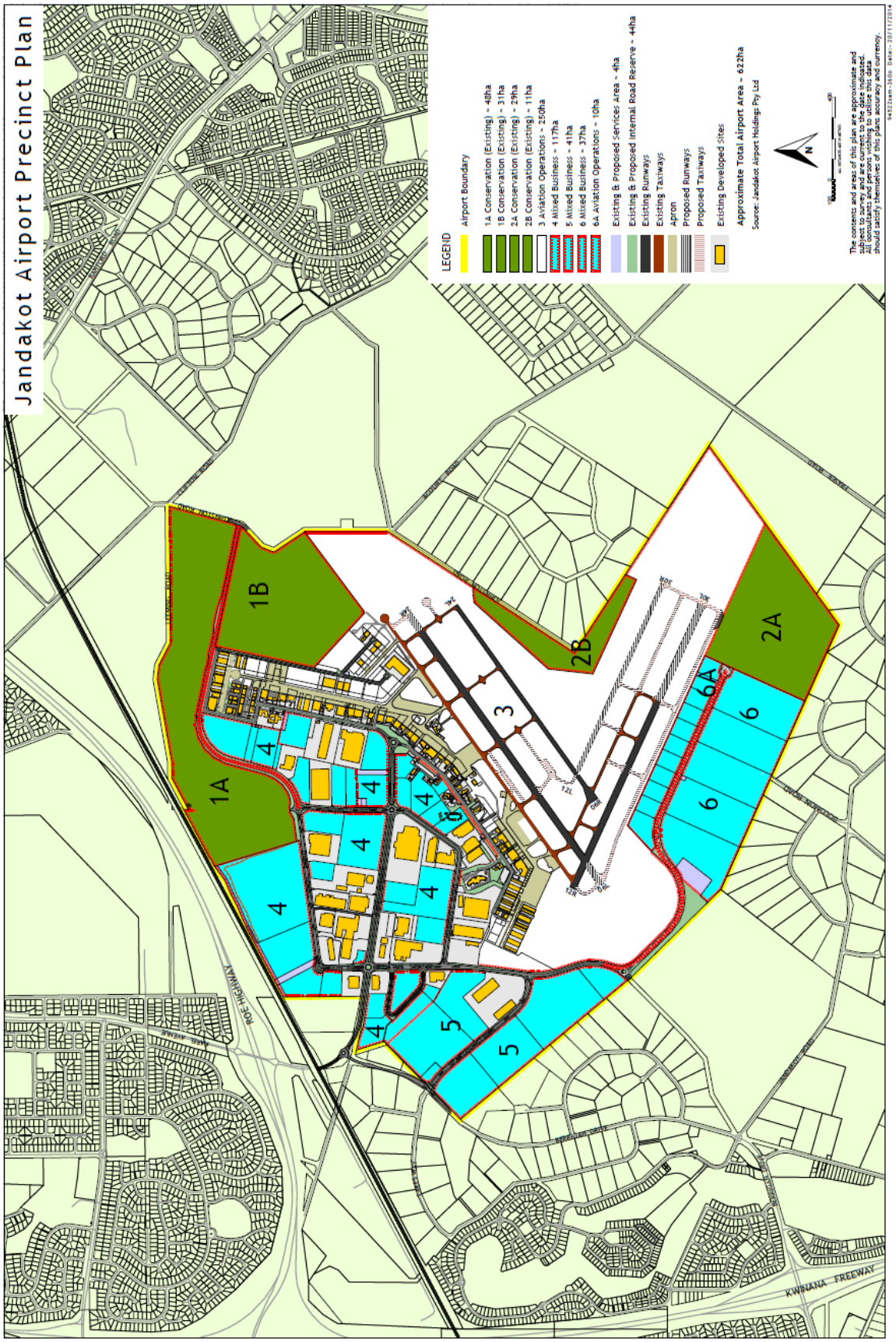

FIGURE 4 JANDAKOT UNDERGROUND WATER POLLUTION CONTROL AREA

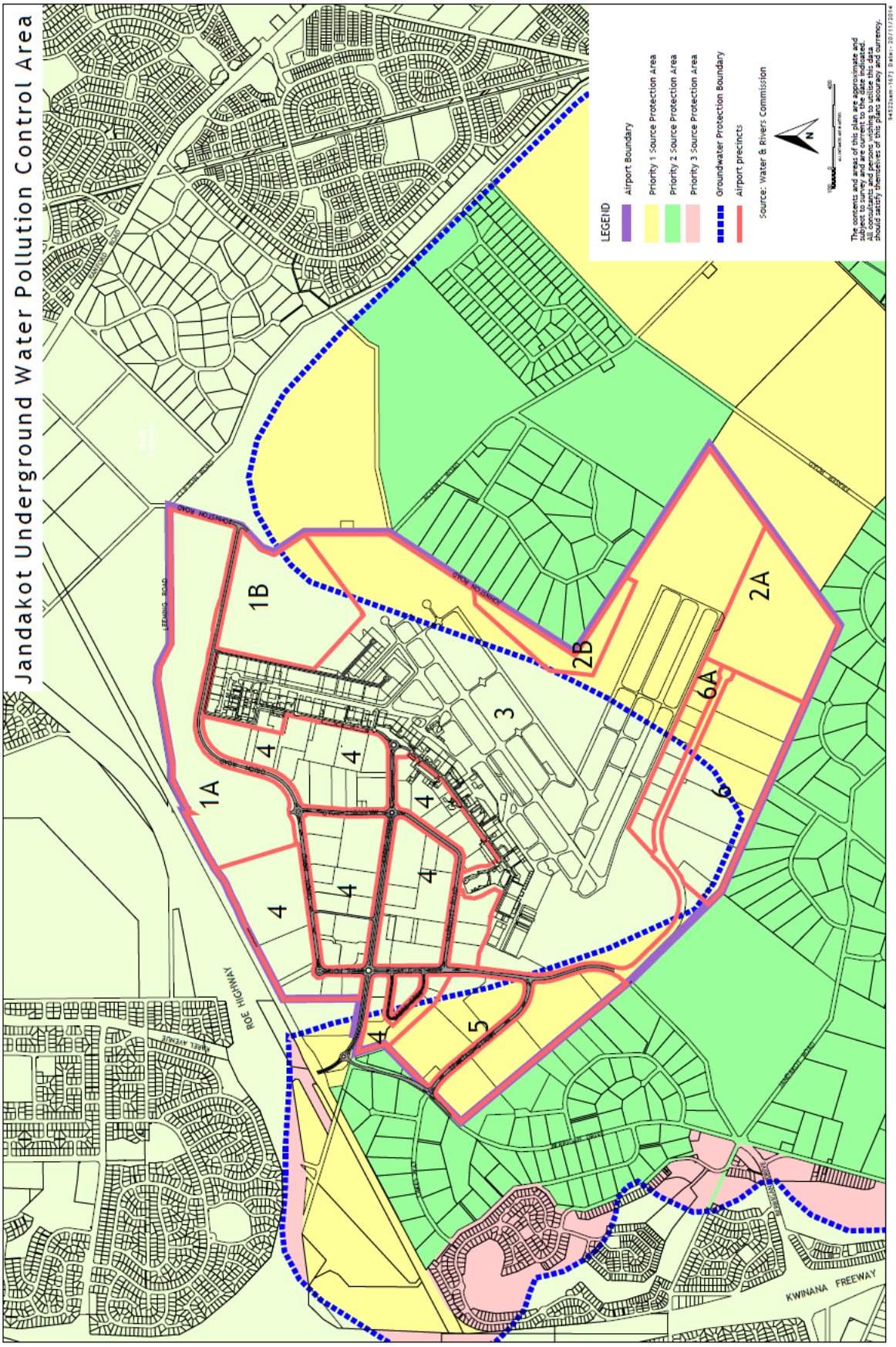

FIGURE 5 ACID SULFATE SOILS

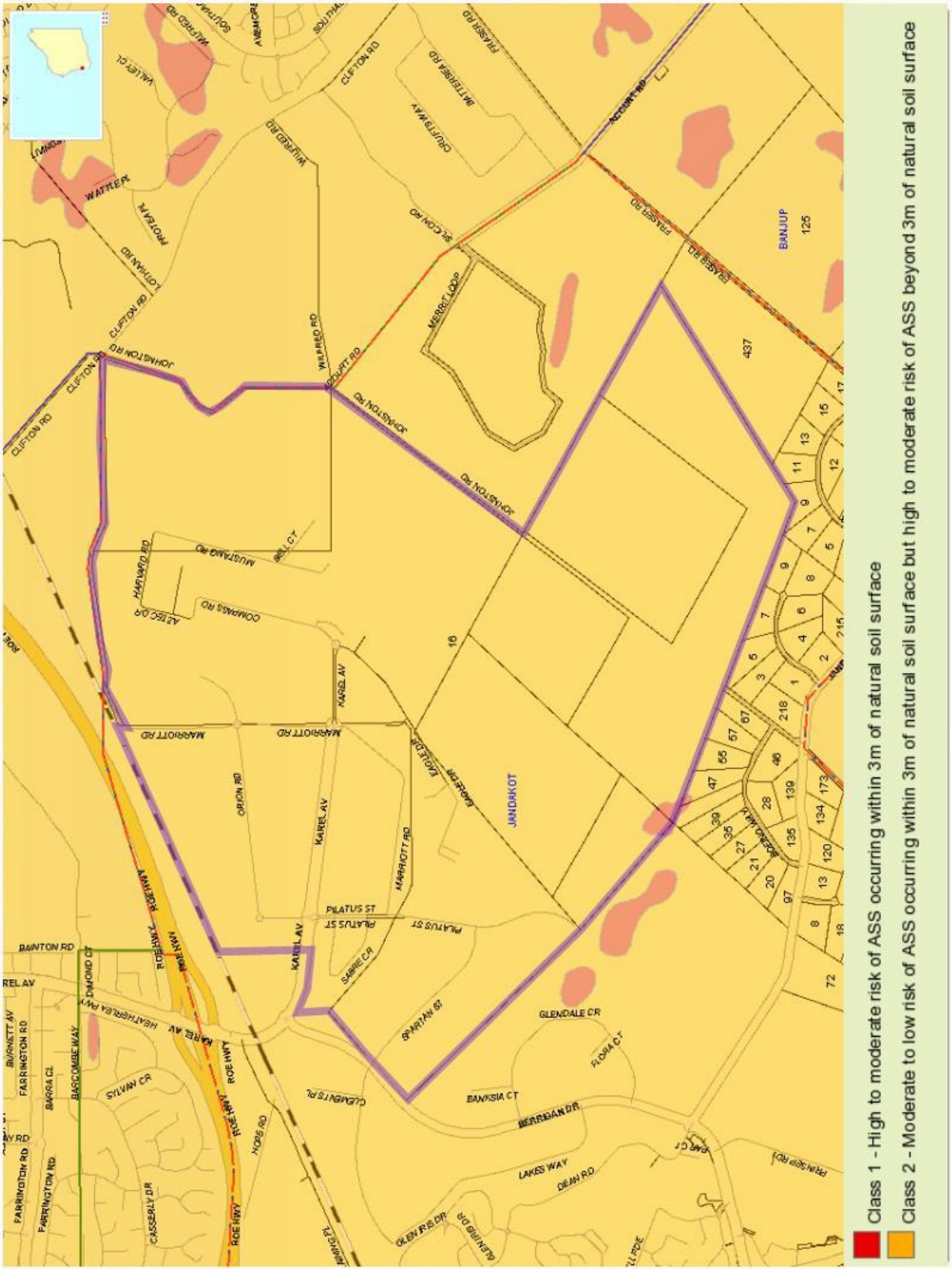

FIGURE 6 PRODUCTION WELLS (WATER CORPORATION)

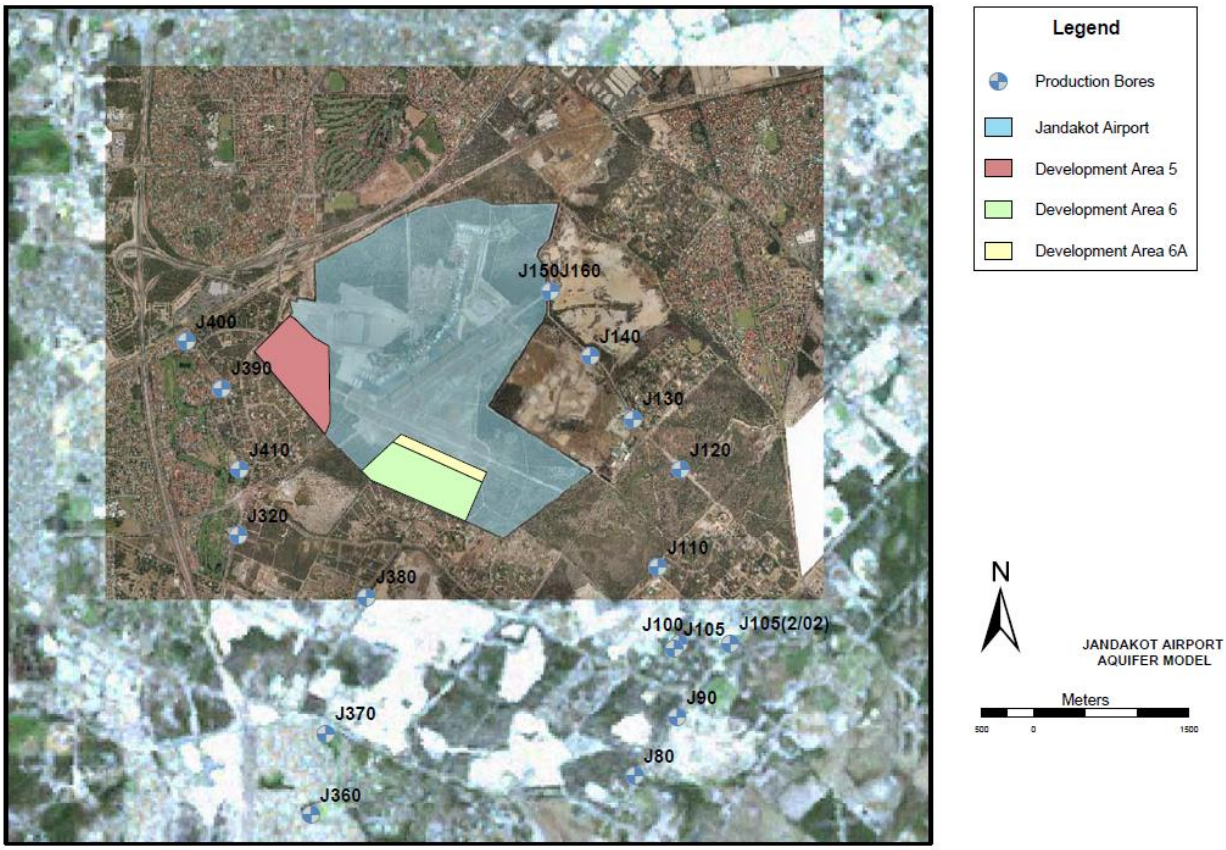

FIGURE 7 OBSERVATION BORES (DWER)

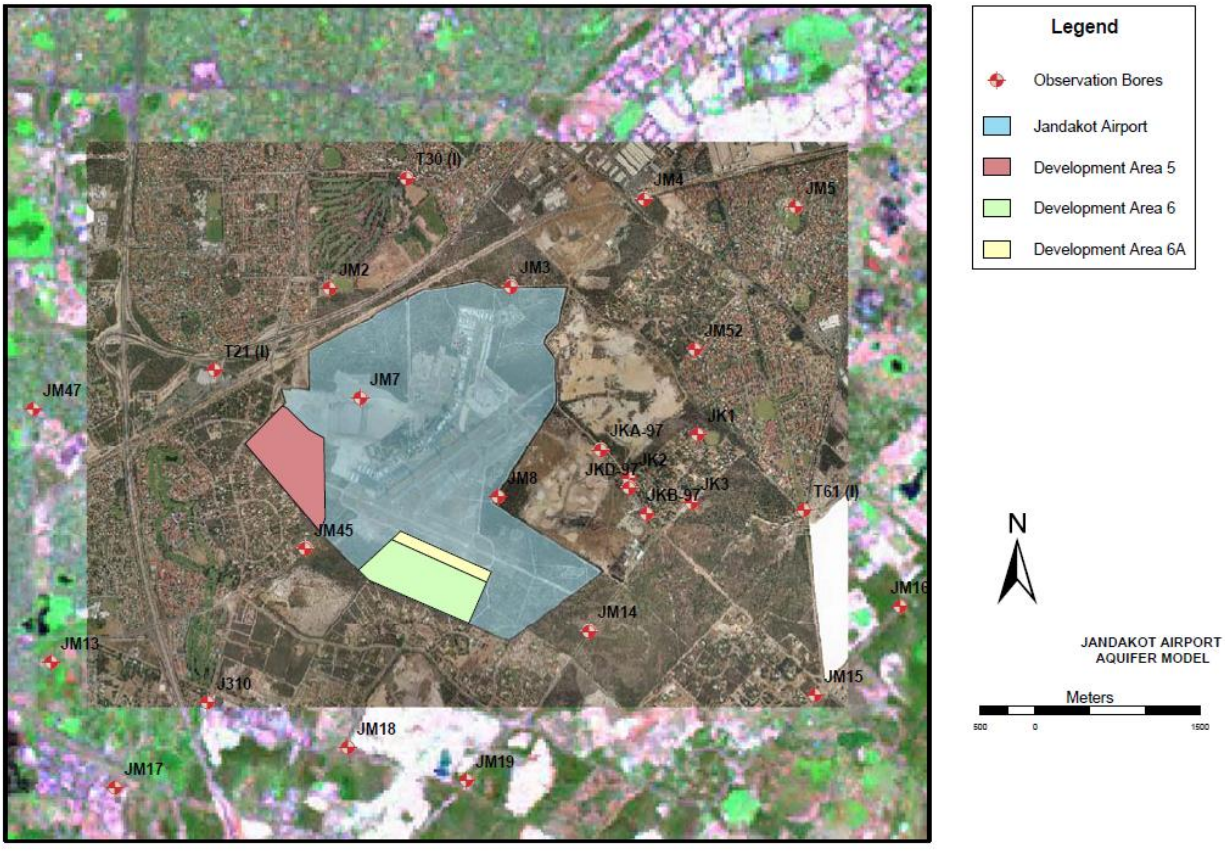

FIGURE 8 JANDAKOT AIRPORT HYDROGEOLOGICAL INFORMATION PLAN

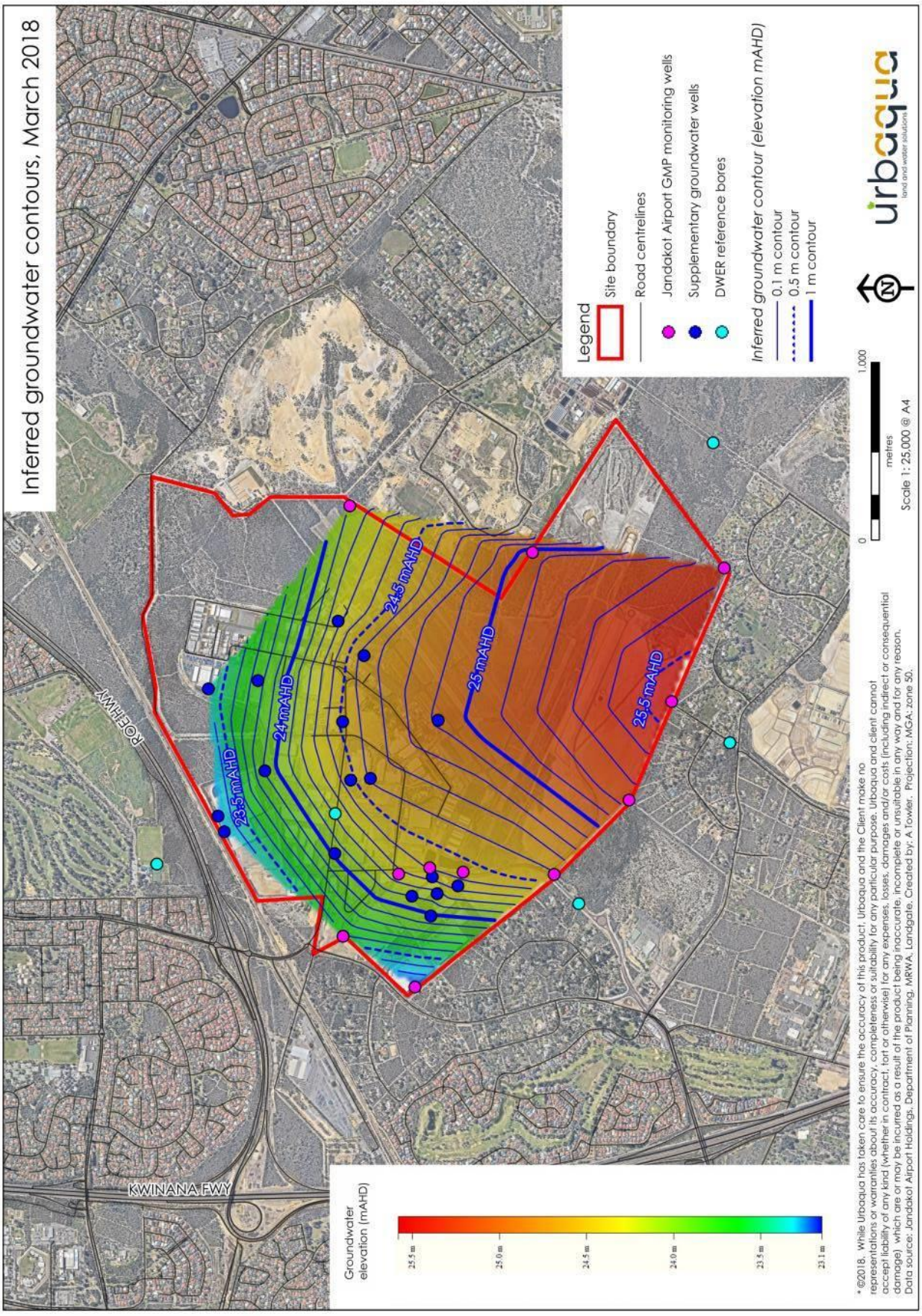

FIGURE 9 GROUNDWATER LEVELS

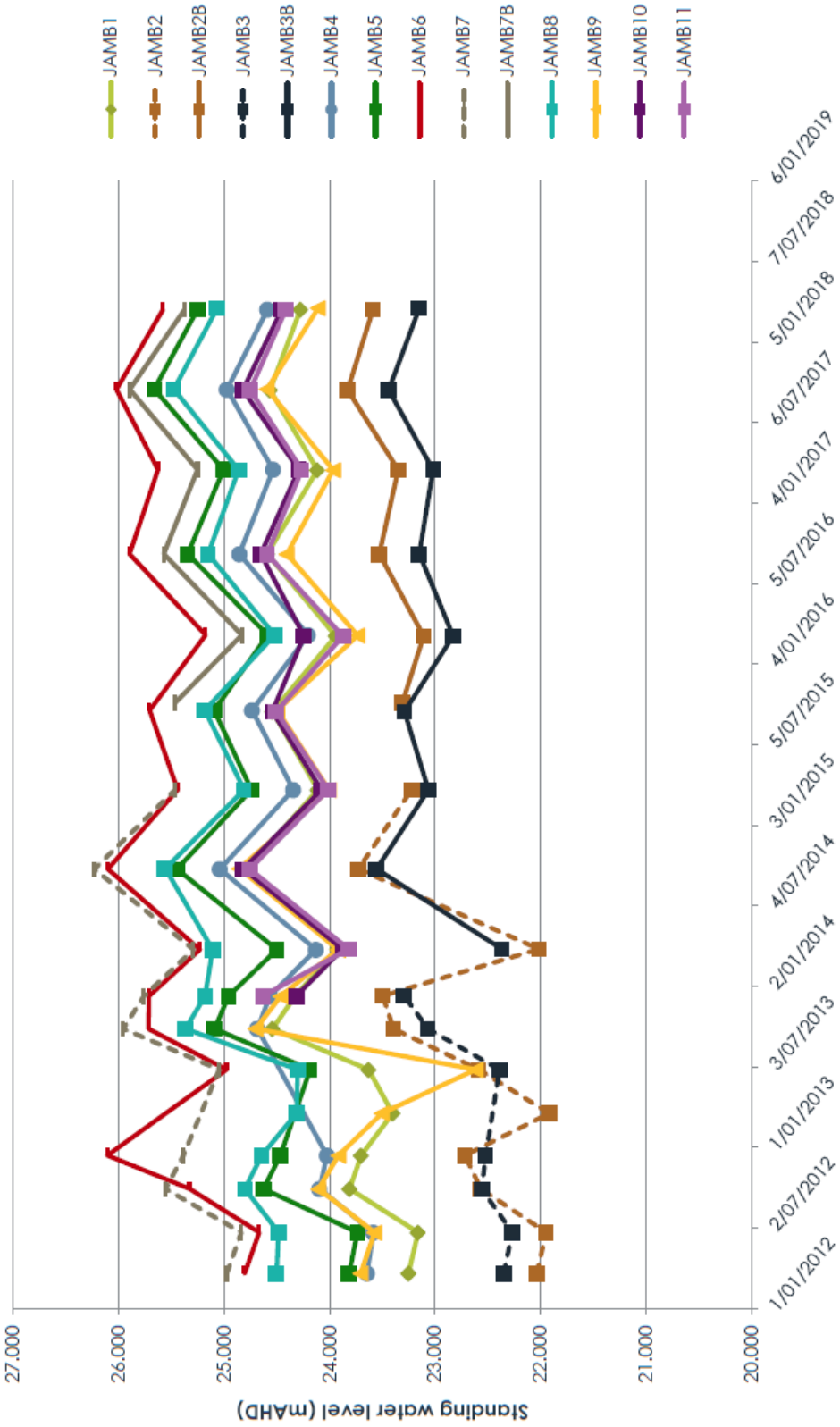

FIGURE 10 GROUNDWATER LEVELS (DWER)

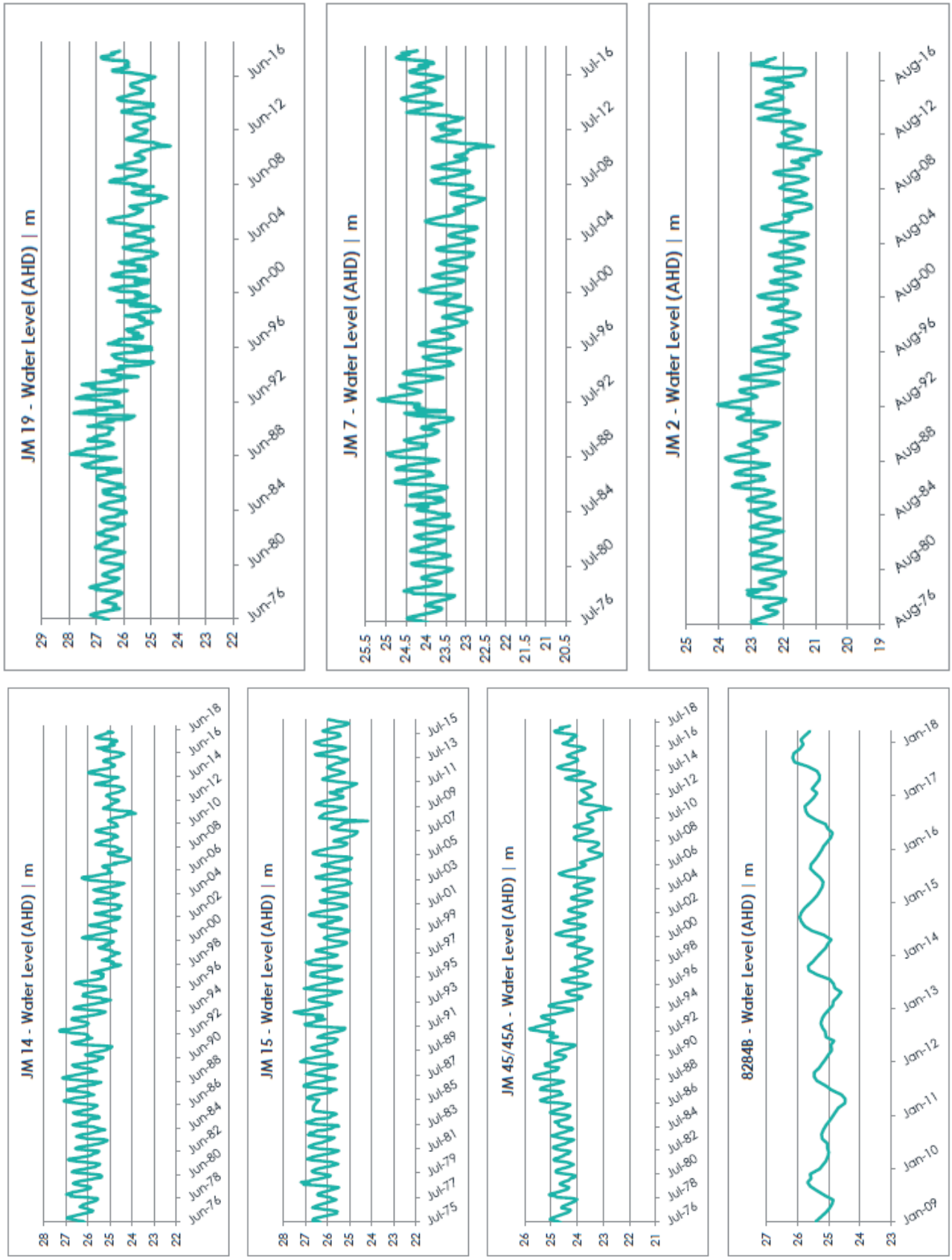

FIGURE 11 JANDAKOT AIRPORT GROUNDWATER ABSTRACTION BORES

Photo Source: Google earth

APPENDIX A: EPBC ACT APPROVALS (EPBC 2009/4796 AND EPBC 2013/7032)

APPENDIX B: LOCAL WATER MANAGEMENT STRATEGY