GLEN IRIS ESTATE

APPENDIX 15
ENGINEERING SERVICES REPORT

JDSi
CONSULTING ENGINEERS

P: 08 9227 0595
F: 08 9227 8817
Level 1, 432 Murray St,
Perth WA 6000
PO Box 7483
Cloisters Square PO
WA 6850
jdsi.com.au

Engineering Servicing Report

GLEN IRIS ESTATE

Acumen Development Solutions

On behalf of Eastcourt Property Group

JDS201817_Rev E

August 2023

INTEGRITY
We are open, honest, and consistent in our principles and conduct, so we're able to build trusted relationships with our clients and partners.

RESPECT
We treat everyone with respect and dignity and develop relationships founded on understanding and trust.

ACCOUNTABILITY
We always assume responsibility for our actions and make decisions in line with our economic, social, and ethical obligations.

EXCELLENCE
We pursue excellence in everything we do, challenging ourselves to look beyond the obvious and ensure ongoing improvement.

This page has been intentionally left blank.

Table of Contents

Appendices

DOCUMENT REVIEW					
Revision	Date Issued	Issue Type	Written By	Reviewed By	Approved By
Rev A	02/06/2021	For Information	BT	SF	BT
Rev B	17/06/2021	For Information	KM	DAH	DAH
Rev C	06/09/2021	For Information	BT	SF	BT
Rev D	16/03/2022	For Information	BT	SF	BT
Rev E	03/08/2023	For Information	BT	SF	BT

1 Introduction and Key Objectives

JDSi Consulting Engineers (JDSi) have been commissioned by Acumen Development Solutions (Acumen). to prepare the Engineering Servicing Report to support a Scheme Amendment and Local Structure Plan application for the proposed residential subdivision across the land holding. JDSi understand the proposed development consists of the following:

- 550 dwellings.
- Small local retail lot abutting Berrigan Drive.
- Public Open Space (POS) and new road and pedestrian networks.

Refer ***Appendix A*** Structure Plan.

The investigations undertaken and preparation of the report have been largely based on desktop studies and some preliminary advice from the service authorities. The information is current as of May 2021 and may be subject to change as development progresses in the area.

The report summarises the results of a review of the civil and electrical engineering related elements of the development:

The key objectives of this report are to:

- Provide commentary on the proposed development and background to the existing site location and conditions.
- Provide commentary on any earthworks and remediation required within the development area.
- Provide commentary on the existing roads, drainage and utility services infrastructure within the vicinity of the development.
- Provide commentary on the proposed road network and any upgrades required to facilitate the proposed development.
- Provide commentary on the overall stormwater drainage strategy for the proposed development.
- Document the Water Corporation's servicing requirements for sewer and water reticulation.
- Document Western Power's servicing requirements for electrical reticulation.
- Document servicing requirement for telecommunication and gas reticulation.

2 Study Area

The proposed Development site is 53.74 ha in size and is located on the former Glen Iris Golf Course in Jandakot. It is located approximately 17km south of Perth on the east side of the Kwinana Freeway, within the City of Cockburn.

The site is generally bounded by existing residential properties, with Glen Iris Drive to the north and west; Dean Road and Prinsep Road to the east; Turnbury Drive and The Lakes Boulevard to the west; and Imlah Court to the south. Berrigan Drive dissects the lower third of the site in an east-west direction, whilst a pedestrian underpass under Berrigan Drive connects the northern and southern portions of the site. Twin Water Pass dissects the northern third of the site via an overpass, from Dean Road to the east, to provide road access to a section of residential properties located centrally in the site.

A portion of former road reserve, being an extension off Hartwell Parade, dissects the site north of Berrigan Drive however this portion does not contain any constructed roadway. A number of existing services are located in this portion of unconstructed road reserve. In addition, there are a number of existing services and corresponding easements located within the site, including sewer, drainage, gas and power.

The site is predominantly cleared due to its former golf course use with some existing low vegetation, native and larger trees along the external boundaries and along edges of former fairways. Some existing, man-made lakes are present on the site however it understood these have recently been drained due to safety concerns and to conserve groundwater that was used for replenishment.

The site is generally contained by 1.8m high chain mesh fencing where abutting public roads and existing limestone retaining walls and residential style fencing where abutting the existing residential private properties.

Figure 1: Site Location

2.1 Topography

A topographical survey for the site has been undertaken by MNG and indicates that the existing surface levels vary from approximately 43.0mAHD in the north, 26.0mAHD in the centre of the site and 24.0mAHD in the south of the site. Some lower elevations of about 24.0mAHD exist in the vicinity of the man-made lakes. The site is generally undulating with some steeper slopes present along the extremities of the land holding in the northern section of the site.

Refer ***Appendix B*** Feature Survey.

2.2 Groundwater

The site is included in the Department of Water and Environmental Regulation's online Perth Groundwater Atlas. Based on post 1990 groundwater levels the Average Annual Maximum Groundwater Level (AAMGL) varies across the site, from approximately 24mAD in the south-east corner to 21mAHD in the north-west corner. Groundwater flow is generally in a north-westerly direction.

JDSi understand that Hyd2o have been commissioned to undertake further hydrological studies on the site, including detailed assessment of groundwater levels to inform the development.

Figure 2: AAMGL – Hyd2o

The subject area falls within the Jandakot Underground Water Pollution Control Area UWPCA). Developers within a UWPCA need to fulfill their legal responsibilities including those covering 'land use' planning, environmental, health and building permit matters. The Department of Water and Environmental Regulation is responsible for managing and protecting Western Australia's water resources. The subject area is also affected by several 300m Wellhead Protection Buffers. These buffers are declared to protect the quality of groundwater being extracted for drinking water. In these zones' groundwater moves rapidly towards wells and any surface contamination moving through the soil could find its way into scheme water supplies. Activities and land uses in these areas are restricted and subject to the Department of Water and Environmental Regulation approval processes in accordance with the Western Australian Planning Commissions current State Planning Policy 2.7.

Engineering Servicing Report
Glen Iris Estate
JDS201817

2.3 Geological Conditions

Published geological maps (Ref. Perth Metropolitan Region 1:50,000 Environmental Geology Series: Fremantle) for the area depict the land as being underlain by Bassendean Sand overlying clayey and silty material of the Guildford Formation at depth.

A detailed Geotechnical Site Investigation, in accordance with AS1726, was completed by CMW Geosciences Pty Ltd between 30 November and 2 December 2020. The scope of fieldwork completed was as follows:

- A walkover survey of the site to assess the general landform, site conditions and adjacent structures;
- 55 test pits, denoted TP01 to TP55, were excavated to depths of up to 2.2m using a JCB 8.5 tonne backhoe fitted with a 450mm wide toothed bucket to investigate the underlying soil conditions, facilitate sampling for laboratory testing and to assess excavatability and earthworks recommendations.
- Perth Sand Penetrometer (PSP) tests were carried out adjacent to each test pit, in general accordance with AS1289.6.3.3, to depths of up to 2.1m to provide soil density/consistency profiles and to provide a subgrade CBR value for pavement design purposes.
- 8 hand auger boreholes were drilled with a 100mm diameter auger to a depth of up to 1.42m to facilitate infiltration testing.

Refer ***Appendix C*** for a copy of the full Geotechnical Site Investigation Report.

The ground conditions encountered and inferred from the investigation were considered to be generally consistent with the published geology for the area and can be generalised according to the following subsurface sequence:

- **TOPSOIL:** dark grey, brown, fine to medium grained, subangular to subrounded sand with trace fines (>12% in TP48); trace organics; trace roots and rootlets; trace branches; trace vegetation, overlying;
- **FILL: SAND (UNCONTROLLED)** loose to very dense, fine to medium grained, subangular to subrounded; grey/pale yellow and orange-brown; trace fine grained limestone gravel (TP04, TP20); trace fines; trace organics; trace roots and rootlets; trace branches. Uncontrolled fill in the form of old reticulation pipe and bricks were found in TP04, TP18, TP28 and TP34. The reticulation pipe uncovered in TP28 and TP34 contained potential asbestos between depth of 0.5 and 1.6 mbgl, overlying;
- **SAND (SP)**: loose to very dense, fine to medium grained, subangular to subrounded; grey/orange/yellow and white; trace fines; trace roots and rootlets, overlying;
- **COFFEE ROCK**: very dense, fine to medium grained, subangular to subrounded, dark brown/black; weakly cemented. (Only found in TP03 TP06, TP12 and TP52). The coffee rock was typically found in or around low energy zones (lakes) located across the site where groundwater may be present.

2.4 Acid Sulphate Soils

Acid Sulphate Soil mapping compiled by Department of Water and Environmental Regulation indicates the site is generally located within an area of "*moderate to low risk of acid sulphate soils occurring within 3 m of natural soil surface*". All excavation works and dewatering in ASS must be carefully managed to avoid any potential damage to surrounding land and water ways.

Figure 3: WAPC ASS Mapping

3 Construction Management

As part of the construction management process the Contractor will need to undertake a number of pre-construction processes, including but not limited to:

3.1 Dilapidation Report

All property owners deemed to be in close proximity to the staged works will be offered an opportunity for a dilapidation report, also known as a property condition report, to be undertaken on their property. This will record the state of the property prior to commencement of works and identify any pre-existing damage and can therefore be used as a baseline against any claims of damage by the property owner. In addition to the Dilapidation Report the Contractor will be required to take out applicable Contract Works insurance and Public Liability Insurance.

3.2 Dust, Noise and Vibration Management Plan

The Contractor will be required to submit for approval a Dust, Noise and Vibration Management Plan to the Local Authority. This will detail the works, construction methodologies and mitigation measures to be implemented in order to comply with relevant legislation and industry codes of practice relating to Dust, Noise and Vibration on construction sites.

3.3 Health, Safety and Environmental Management Plan

The Contractor will be required to submit for approval a Health, Safety and Environmental Management Plan to the Local Authority. This will detail the works, construction methodologies and mitigation measures to be implemented in order to comply with relevant legislation and industry codes of practice relating to Health, Safety and Environment on construction sites.

3.4 Traffic Management Plan

The Contractor will be required to submit for approval a Traffic Management Plan to the Local Authority and/or Main Roads WA where works are being undertaken within public road reserves. This will detail the works areas, working times, road closures and traffic management controls to be implemented whilst working in public road reserves. This plan will consider both vehicle traffic and pedestrian traffic in the vicinity of the works areas.

4 Demolition and Earthworks

4.1 Demolition & Clearing

The existing, large mature trees will form an important asset to the proposed Development. To ensure the protection and integration of existing vegetation a tree retention plan will be implemented which will require the identification and flagging of all trees and vegetation to be retained prior to any earthworks occurring on site. Tree Protection Zones, as prescribed by AS4970, will be established and maintained throughout the works via the use of bunting and fencing where applicable. Any works undertaken within the nominated Tree Protection Zones will be undertaken in consultation with the project Arborist to preserve the health and viability of the retained trees. Clearing areas and any trees to be removed will be marked prior to earthworks commencing and all nominated trees and vegetation will be removed carefully so as to not disturb foliage and roots of any adjoining trees.

Any redundant infrastructure, fencing, scrap material or rubbish located on the site will need to be removed and disposed of to an approved tipping location prior to works on site. It is understood that the existing Clubhouse building will be demolished as part of the works. A specific demolition methodology should be implemented for this process.

Any Presumed Asbestos Containing Material (PACM) encountered during the works will trigger a notification by the Contractor in accordance with a site specific “Unexpected Finds Protocol”. Works in the area will cease immediately and the area will be cordoned off and made safe. The projects Environmental Consultant will then provide a methodology to remove and dispose of the material safely to an approved waste handling facility and provide a validation report upon completion of any remediation. All works relating to PACM will be undertaken in accordance with:

- National code of practice for the safe removal of asbestos 2nd edition [NOHSC:2002(2005)], and
- Department of Health’s Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009)

4.2 Earthworks

To complete bulk earthworks required for the Development the following construction methodology is recommended:

- Identification and protection of all trees to be retained, prior to removal of nominated trees and grubbing of roots.
- Vegetation and turf removal including grubbing of roots within clearing areas.
- Stripping of topsoil (approx. 100mm thick) for reuse in POS or non-structural areas of the site.
- Tyne the top 400mm of the surface to expose any uncontrolled fill or waste materials for removal.
- Moisture condition and recompact the tyned surface.
- Cut to fill operations across the site, including moisture conditioning and compaction to achieve the target density.

All bulk earthwork operations should be witnessed by a suitably qualified Geotechnical Engineer and control testing undertaken in accordance with AS3798.

Further information related to bulk earthworks can be found in the CMW Geosciences Pty Ltd Geotechnical Investigation Report (Refer ***Appendix C***).

5 Wastewater Reticulation

The Water Corporation owns and maintains the wastewater reticulation network in the area.

Planning advice received from the Water Corporation confirms that the Development is currently within both the Bibra Lake and Jandakot Sewer District (SD). Based on the existing contours, a small area of the site north of Berrigan Drive (highlighted in yellow on Figure 4) is currently included in the Bibra Lake SD, however this will be changed to the Jandakot SD catchment, and would be served by Glenbawn Drive Sewer Pump Station instead of the Virgilia Terrace Sewer Pump Station.

Water Corporation have advised that there are numerous upgrades required to downstream headworks infrastructure including collection sewers, pump stations and pressure mains however these works will be undertaken by Water Corporation as the Development progresses and new flows come online. Standard Water Corporation per lot headworks charges will be paid by the Developer to fund infrastructure upgrade works.

As a result of the proposed Development there is a reticulation sewer that is downstream of the Development that may need to be upgraded as development progresses. Approximately 825m of existing DN225 reticulation sewer from manhole number T9948 to S0697 may need to be upgraded to DN300 (refer Figure 5 for location). The Developer will need to liaise with the Water Corporation for any upgrade works to external infrastructure.

All new wastewater works installed for the Development will need to be designed and constructed in accordance with Water Corporations guidelines, including the Developers Manual and Design and Construction Requirements for Gravity Sewer DN150 to SN600 (DS50). It is noted that there are numerous live wastewater lines located within the Development site and these are covered by existing easements in favour of the Water Corporation. The Development layout and construction methodologies will need to consider the location of these services throughout the Development process in order to maintain services to all existing properties.

Figure 4: Water Corporation Sewer Catchments

6 Water Reticulation

The Water Corporation owns and maintains the potable water reticulation network in the area.

Based on planning advice received from the Water Corporation, to accommodate the new subdivision, upgrades will be required to headworks infrastructure including existing distribution mains however these works will be undertaken by Water Corporation as the Development progresses. Standard Water Corporation per lot headworks charges will be paid by the Developer to fund infrastructure upgrade works.

To service the new subdivision a typical water reticulation network will be installed within the new road reserves and it is expected that both the northern and southern sections of the site will be connected to the existing DN500 distribution main located in Berrigan Drive. Water Corporation has indicated both mains will need to be DN150. Water Corporation provided the below sketch indicatively showing the DN150 for the southern portion of the site – Figure 5. A sketch for the northern portion was not provided by the Water Corporation and will be resolved during detailed design.

All water main extensions required for the development site will be laid within the existing and proposed road reserves, on the correct alignment and in accordance with the Utility Providers Code of Practice and Water Corporations Water Reticulation Pipelines DN250 and Smaller (DS63).

Figure 5: Water Corporation DN150 Water Reticulation route

7 Roadworks

The surrounding road network is under the control of the City of Cockburn and as such all works on and abutting the public roads will be subject to their approval. The roads abutting the development are generally considered to be Access Roads, with the exception of Berrigan Drive, which is a Distributor A, and Prinsep Road, which is a Local Distributor. The existing road network typically consists of formed pavements with kerbing and an asphalt wearing course.

Based on the current plans, access to the Development site will be via the existing road network, with multiple points of connection. It is proposed to install a new 4 way signalised intersection onto Berrigan Drive however this is subject to ongoing review and approval by City of Cockburn and Main Roads WA. JDSi understand that a Transport Impact Assessment is being completed by GTA Consultants to inform the Scheme Amendment and Local Structure Plan, including recommendations on any intersection upgrades required to accommodate the increased traffic loading.

The new road network will be consistent with standard residential developments including kerbed and asphalted pavements and road cross-sections will be designed to align with the existing landform. In all cases the road cross sections will be designed to cater for utility services on standard verge alignments and appropriate stormwater management strategies.

In several instances, the road reservations will be substantially wider than standard access roads to accommodate the retention of mature trees in interface buffers adjoining the existing homes around the site.

Any new public roads, parking areas and footpaths will need to be designed in accordance with City of Cockburn standards and guidelines, Local Government Guidelines for Subdivisional Development (IPWEA) and Main Roads WA requirements.

8 Stormwater Drainage

Urban Water Management (UWM) is now a key part of any development process incorporating principles of integrating water and land use planning, considering all water sources in water planning, integrating water use and natural water processes and a total catchment integration of natural resource use and management (Ref. Stormwater Management Manual for Western Australia, DOW, April 2004 the State Water Strategy 2003 and the State Water Plan 2007).

Stormwater drainage management is a major component of an overall UWM strategy for which achievement of the principals of the plan may be facilitated through the application of Water Sensitive Urban Design (WSUD) techniques during planning, design and construction of urban development projects. Objectives of WSUD include but are not limited to the following:

- Detention of stormwater rather than rapid conveyance to maintain pre development flows for quantity management;
- Use of vegetation for filtering purposes and nutrient stripping for quality management;
- Use of stormwater to conserve potable water; and
- Water efficient landscaping.

A UWMP is currently being prepared for the development site with its purpose being to provide the framework for the application of total water cycle management to the proposed design consistent with Better Urban Water Management (WAPC, 2008) and Department of Water and Environmental Regulation (DWER) principles of Water Sensitive Urban Design (WSUD) as described in the Stormwater Management Manual (DoW, 2007).

In general, the stormwater management strategy for the site will:

- Maintain pre-development peak flow rates into and out of the site.
- Retain up to 1% AEP critical event on-site unless there is a downstream basin or water body which has got the capacity to accommodate runoff from the development.
- Retain 10% AEP rainfall within Lots.
- Set habitable floor levels at least 0.3 m above the 1% AEP flood level of the urban drainage system.
- Utilise a pit and pipe network, or roadside swales where possible, to cater for flows up to 10% AEP rainfall events, while greater than 10% AEP flow will be conveyed via overland flow through the road network.
- Retain and infiltrate rainfall on site using basins and/or underground storage.
- Demonstrate that the land is capable of managing stormwater for all events up to the 1% AEP event.
- Ensure all basins and underground chambers within the estate are designed to cater for the 1% AEP critical event on-site.
- Controls used to improve stormwater quality will be included within roadside swales, open channels and stormwater retention systems such as planting of specific vegetation and possible utilisation of an amended soil profile to assist in nutrient retention and breakdown.
- The use of native vegetation where practicable, minimal fertiliser application and soil amendment in major drainage areas will assist with the management of groundwater and surface water quality.

Of particular importance for this site is that a large area of the external developed areas all discharge into the former Golf Course site. These external catchments will need to be managed and incorporated into the proposed drainage design for the subdivision. Various options include:

- Maintain the existing open basins on the site in their existing location, noting that some of these are currently fenced, with steep side slopes.

- Revise the external drainage network and outlet locations and consolidate these into new storage and infiltration areas within the development area.
- Install new inline storage and infiltration structures higher up in the catchments to reduce the inflow volumes to the new subdivision.

The specific option to be utilised at each location will depend on the catchment size, availability of POS and road reserve areas and depth of outlet pipework compared to the design surface.

Based on the permeability tests undertaken on the insitu sand material the infiltration rate is very high for this site. This means that drainage areas won't need to be large in area and the site will lend itself to the various underground storage options.

As the City of Cockburn will ultimately own and maintain all stormwater infrastructure the design and construction work will need to be undertaken in accordance with their guidelines and standards, as well as the Local Government Guidelines for Subdivisional Development (IPWEA).

9 Power Supply

9.1 Existing Power Network

The following advice is based on a JDSi desktop study and support information obtained from the Western Power NCMT (Network Capacity Mapping Tool) online database.

Murdoch Zone Substation is the closest bulk electricity supply point to the new residential development site. Based on Western Power forecasts for remaining capacity through to 2026 there is between 10-15MVA capacity available within the area as shown in Figure 6.

An existing Transmission line (330kV) exists at the southern side of the development along Imlah Court. A clearance assessment will need to be undertaken by Western Power to consider any restrictions. This will have an impact on constructability of above ground infrastructure and buildings within the powerline easement. It is noted that the tenure of the Western Power Transmission Line corridor will need to be resolved as the City of Cockburn do not accept management responsibility or POS crediting for powerline easements.

Existing High Voltage (HV) overhead lines exist on the east side of development along Prinsep Road with various sections of Underground HV located within the vicinity of the project servicing the existing residential lots. These are not 'backbone feeders' that can be utilised for extension of the HV network.

Existing Low Voltage (LV) underground power exists within the surroundings of the development. Further investigation via a Western Power DIP or Feasibility Study will be required to determine any network capacity available to supply the required load for the proposed subdivision.

Figure 6: Western Power Forecast Capacity for 2026

9.2 Proposed Power Network

The proposed residential development of Glen Iris Estate requires an anticipated power supply of approximately 3500kVA. The following table shows the breakdown of the anticipated load.

Load Type	Number of lots	kVA Allocated
Residential	550	2750 (@ 5kVA/lot)
Public Open Space	20	600 (@ 30kVA/lot)
Commercial	1	150 (@ 200kVA/ha)
Total	**571**	**3500**

Table 1: Power Load Breakdown for Glen Iris Estate.

Western Power owns and operates all electrical supply network assets within the development area and therefore all new electrical supply equipment and cables will need to be installed in accordance with Western Power, WAER (West Australian Electrical Requirements), AS3000 specifications and Standards.

Based on JDSi's initial assessment, it is anticipated that 6 substation sites (combination of transformer and switchgear) will be required to service the entirety of the proposed development.

It is unlikely that overhead powerlines will be required to be undergrounded as part of the WAPC Conditions. The existing underground Western Power assets supplying the surrounding lots will be required to be interconnected and/or reinforced as part of the new underground HV network.

Western Power cannot reserve network capacity therefore we recommend the Developer lodge a formal application with the Utility as soon as practicable. The Development's electricity load requirements will be required to be approved by Western Power, along with the design and installation of nay new assets.

10 Gas

ATCO Gas own and maintain the existing underground gas network in the vicinity of the Development.

Reticulated gas is not considered to be an essential service and as such is not required as a condition of subdivision. However, it is usual practice to install a gas reticulation network for a residential subdivision within a common civil services trench. If there is an extension required to connect to the nearest main or to bore under major roads the Developer will be required to pay for this as a headworks cost. All new gas installations will be designed by ATCO Gas and installed as part of the civil works.

Advice from ATCO Gas is that the existing MAOP 70kPa network surrounding the Glen Iris Estate will be able to supply the proposed development. Figure 7 below shows the likely connection points to the existing network and provides options in terms of staging.

There is also an existing DN150 PVC medium pressure gas main that runs through the northern part of the site through the existing Dean Road reserve. The Thornlie Cockburn Link project team are also proposing to install a DN200 steel high pressure gas main through the site along the same alignment as the existing main. This is replacing existing gas mains which currently run through the proposed rail reserves. These mains will also provide opportunity for connection and have been designed to ensure there are no limitations for development in the future.

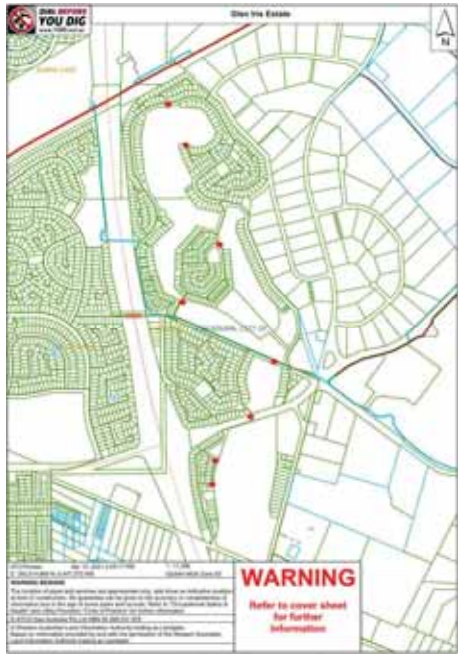


Figure 7: Western Power Forecast Capacity for 2026

11 Telecommunications

Based on Dial Before You Dig reports there is existing Telstra and NBN owned pit and pipe network within the vicinity of the Development. The NBN Rollout Map indicates that the wider Glen Iris area is covered by the NBN network and is “service ready”. Existing properties surrounding the development site are covered by a fixed line, Fibre To The Node (FFTN) service.

Advice from NBN is that the site is within their existing fixed footprint, and as such there will be no additional costs for backhaul to service the Development.

General communication services for the development will consist of the installation of a standard pit and pipe network in accordance with NBN Co guidelines and standards. The current design practice for road reserves, pavement and verge provisions will make adequate allowance for services in accordance with the agreed Utilities Service Providers handbook. There will be some local land requirements for equipment sites which will be accommodated at detailed subdivision stage.

To progress the design and installation of a new communications network a New Development Application will need to be submitted to NBN and this agreement would confirm any Developer requirements. Developers will be required to cover the costs of trenching and ducting for the infrastructure, however NBN Co will cover the other costs of installing fibre infrastructure, including backhaul.

Figure 8: NBN Map

In relation to City of Cockburn's "*Local Planning Policy 5.19 – Structure Plans & Telecommunications Infrastructure*", the following summarises the mobile telecommunication infrastructure and coverage in the local area.

The below figure shows mobile phone towers in the vicinity of the site. This information was sourced from the Radio Frequency National Site Archive (RFNSA) which is managed by the Australian Mobile Telecommunications Association (AMTA).

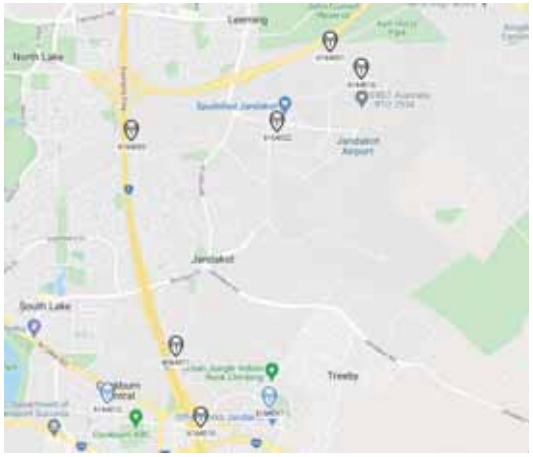


Figure 9: Location of Mobile Phone Towers

Mobile phone coverage in the vicinity of site is provided by Telstra, Optus and Vodaphone. Based on the coverage maps from these providers there is does not appear to be any issues with coverage or capacity in the development area.

Figure 10: Telstra 5G Coverage

Figure 11: Optus Mobile Coverage

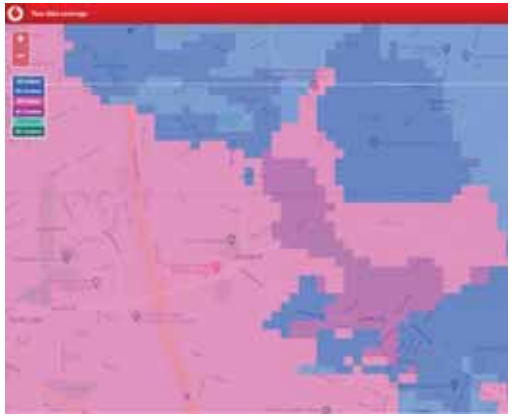


Figure 12:Vodaphone Mobile Coverage

In February 2022 JDSi contacted the Mobile Black Spot Program Team, which is being managed by the Department of Infrastructure, Transport, Regional Development and Communications, to inform them of the proposed development. As at the date of this report no specific feedback has been received, however a generic response was received, and a copy is included in ***Appendix E***.

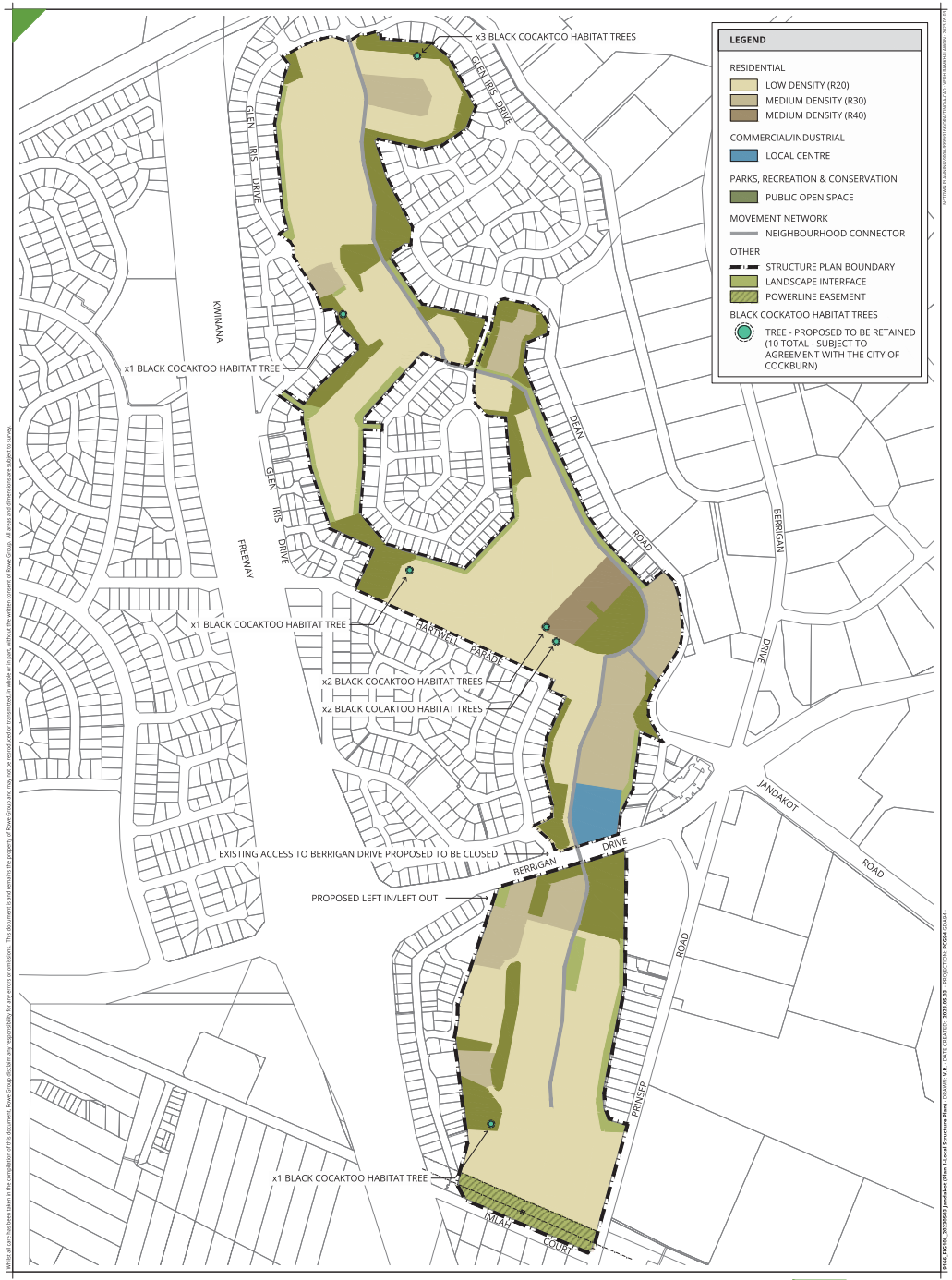
12 Disclaimer

JDSi have undertaken this assessment based on a desktop study and preliminary discussions with service authorities and subsequently assumptions have been made which, if incorrect, have the potential to change the assessment and/or recommendations. Major cost implications exist through factors which cannot be assured at this time including, but not limited to, upgrading and provision of utility services, conditions of development, Local Authority Scheme Requirements, ground conditions and timing of adjacent developments.

While JDSi has taken all care in the preparation of the likely development requirements and has noted key assumptions, JDSi accepts no responsibility for the accuracy of this report and provides it only as an indicative summary of engineering requirements.

If any further information is required or should you wish to clarify any issue, please contact our office.

APPENDIX A
PROPOSED STRUCTURE PLAN



PLAN 1 - LOCAL STRUCTURE PLAN
GLEN IRIS DRIVE
JANDAKOT

NORTH
0 150m
SCALE @ A3: 1:6000
9166-FIG-10-L

ROWE GROUP DESIGN

APPENDIX B
FEATURE SURVEY

APPENDIX C
GEOTECHNICAL REPORT

23 December 2020

PROPOSED RESIDENTIAL SUBDIVISON GLEN IRIS GOLF COURSE, JANDAKOT, WA GEOTECHNICAL INVESTIGATION REPORT

Eastcourt Property Group

Ref. PER2020-0452AB Rev 0

PER2020-0452AB		
Date	Revision	Comments
23 December 2020	0	FINAL GEOTECHNICAL REPORT

Table of Contents

Figures

Appendices

GLEN IRIS ESTATE SUBDIVISON, JANDAKOT, WA – GEOTECHNICAL INVESTIGATION 23 DECEMBER 2020

1 INTRODUCTION

CMW Geosciences Pty Ltd (CMW) was authorised by Mitch Dodson of Acumends Development Solutions on behalf of Eastcourt Property Group to carry out a geotechnical investigation of a proposed residential subdivision development site located at the Glen Iris Public Golf Course on Dean Road, Jandakot WA by way of email authorisation dated 16 November 2020. The scope of work and associated terms and conditions of our engagement were detailed in our services proposal referenced *PER2020-0452AA, Rev 0*, dated 28 October 2020.

The purpose of this report is to describe the investigation completed, the ground conditions encountered and to provide recommendations with respect to geotechnical aspects of the proposed development including site preparation and earthworks, site classification, suitable foundation parameters, drainage, and the identification of geohazards and risks to the proposed development.

2 SITE DESCRIPTION

The proposed development site is approximately 53ha and will be located at the previous location of the Glen Iris Public Golf Course along Dean Road, Jandakot WA which has since been closed (refer to attached Site Investigation Plan – Figure No. 01).

For better understanding, the site has been split into three distinctive areas as seen in Figure 01. The first area, the most northern precinct is bound to the north, east and west by existing residential developments along Glen Iris Drive, and to the south by residential developments along Portsea Gardens and Twin Waterers Pass. Surface levels obtained from an imagery survey conducted by MNG (Ref. *102160-OPM-007-A*) on 09 April 2019 indicates this area is relatively steeply sloping from RL 43m AHD along the northern most boundary to RL 27m AHD along the southern boundary. The southeastern area also slopes gradually towards the centre of the northernmost lake (RL 34m AHD).

The central precinct is bound to the east by existing residential developments along Dean Road and Par Cresent which is further south, to the south by Berrigan Drive and to the west by residential developments along Hartwell Parade, Glacier Way, Eadie Cresent and Glen Iris Drive. In the centre of the precinct there are a large number of further residential developments linked by an array of roads and accessways connected to Twins Waters Pass. Near the southwestern corner of the area an existing single storey clubhouse development is located with associated carparking. Surface levels obtained from an imagery survey conducted by MNG indicates this area is relatively consistent, gently sloping from RL 27m along the northern boundary to RL 28m AHD along the southern boundary.

The southernmost precinct is bound to the north by Berrigan Drive, to the east by Prinsep Park and Prinsep Road, to the south by Imlah Cresent and to the west by residential dwellings along The Lakes Boulevard and The Fairway. In the southwestern most corner, there is two single story maintenance workshops with associated paved accessways. Surface levels obtained from an imagery survey conducted by MNG indicates this area is gently sloping from RL 26m AHD along the southern boundary to RL 29m along the northern boundary.

Surface levels are only indicative as there are numerous undulations, swales and isolated elevated areas, bunkers and fairways that mould the topographical profile of the entire site.

The site was previously used as a public golf course therefore the site contains relatively cleared areas. Vegetation cover comprises grass with some small to large sized trees lining the outsides of the fairways. There are also six manmade lakes located across the site.

It is believed the existing developments on the golf course will be demolished prior to the bulk earthworks for the proposed subdivision.

Aerial imagery from Landgate show that prior to the development of the golf course in 1965 the site was previously in use as agricultural lands. The surrounding areas have undergone significant land development and subdivision that appears to have affected the current golf course. In addition, the golf course layout has largely been man-made by earthworking. Because of this, there may be uncontrolled fill, very loose sands, buried topsoil or other unsuitable material present in areas of the site. In addition, there could be unsuitable material in the lake beds.

3 PROPOSED DEVELOPMENT

The plans supplied depict the area of approximately 53ha will be divided into approximately 600 to 800 residential lots with Public Open Space (POS), drainage basins plus associated accessways and roadways. At present, however, no specific engineering details of the proposed land development have been provided.

We anticipate that significant cut to fill earthworks will be required in order to form finished ground levels. The magnitude of the cut to fills assume the lots will be stepped from east to west. It is also understood that retaining walls will be constructed to assist with the development of the lots.

4 FIELD INVESTIGATION

The field investigation was carried out from 30 November 2020 to 02 December 2020, following a dial before you dig search. All fieldwork was carried out under the direction of CMW Geosciences Pty Ltd in general accordance with AS1726 (2017), Geotechnical Site Investigations. The scope of fieldwork completed was as follows:

- A walkover survey of the site to assess the general landform, site conditions and adjacent structures;
- 55 test pits, denoted TP01 to TP55, were excavated to depths of up to 2.2m using a JCB 8.5 tonne backhoe fitted with a 450mm wide toothed bucket to investigate the underlying soil conditions, facilitate sampling for laboratory testing and to assess excavatability and earthworks recommendations. Engineering logs of the test pits and photographs are presented in Appendix A;
- Perth Sand Penetrometer (PSP) tests were carried out adjacent to each test pit, in general accordance with AS1289.6.3.3, to depths of up to 2.1m to provide soil density/consistency profiles and to provide a subgrade CBR value for pavement design purposes. Graphical results of the PSP plots are presented on the test pit logs in Appendix A;
- 8 hand auger boreholes were drilled with a 100mm diameter auger to a depth of up to 1.42m to facilitate infiltration testing. Results of the permeability test are presented in Appendix B.

The approximate locations of the respective investigation sites referred to above are shown on the attached Site Investigation Plan (Figure No. 01). Test locations were selected by CMW with input from Steve Foley (JDSi) on specific areas to target/stay clear of during the investigation. Test locations were measured using a hand-held GPS to an accuracy of ±5m. Elevations were inferred from the imagery survey conducted by MNG (Ref. *102160-OPM-007-A*) on 09 April 2019.

5 LABORATORY TESTING

A small program of soil laboratory testing was carried out on representative soil samples generally in accordance with the requirements of the latest edition of AS1289 (where applicable).

Testing was carried out on samples selected by CMW and carried out by Western Geotechnical & Laboratory Services Pty Ltd (WGL), a NATA registered laboratory.

The following laboratory tests were carried out:

- 8 Organic Content Test (Loss on Ignition).

The laboratory test results, and associated certificates are provided in Appendix C.

6 GROUND MODEL

6.1 Geology

Published geological maps (Ref. Perth Metropolitan Region 1:50,000 Environmental Geology Series: Fremantle) and the CMW investigation database for the area depict the land as being underlain by Bassendean Sand overlying clayey and silty material of the Guildford Formation at depth.

Based on the known history of the site and surrounding land levels, some superficial depths of fill were also anticipated because of the previous agricultural use of the land.

6.2 Subsurface Conditions

The ground conditions encountered and inferred from the investigation were considered to be generally consistent with the published geology for the area and can be generalised according to the following subsurface sequence:

TOPSOIL: SAND / CLAYEY SAND	dark grey, brown, fine to medium grained, subangular to subrounded sand with trace fines (>12% in TP48); trace organics; trace roots and rootlets; trace branches; trace vegetation, overlying;
FILL: SAND (UNCONTROLLED)	loose to very dense, fine to medium grained, subangular to subrounded; grey/pale yellow and orange-brown; trace fine grained limestone gravel (TP04, TP20); trace fines; trace organics; trace roots and rootlets; trace branches. Uncontrolled fill in the form of old reticulation pipe and bricks were found in TP04, TP18, TP28 and TP34. The reticulation pipe uncovered in TP28 and TP34 contained potential asbestos between depth of 0.5 and 1.6 mbgl, overlying;
SAND (SP)	loose to very dense, fine to medium grained, subangular to subrounded; grey/orange/yellow and white; trace fines; trace roots and rootlets, overlying;
COFFEE ROCK	very dense, fine to medium grained, subangular to subrounded, dark brown/black; weakly cemented. (Only found in TP03 TP06, TP12 and TP52). The coffee rock was typically found in or around low energy zones (lakes) located across the site where groundwater may be present.

Of the six manmade lakes located across the site, only TP48 was able to excavate the base of the lake due to the lake being empty. A green plastic liner was found approximately 0.5m below the base of the lake overlying the natural sand. It is assumed this liner is present at the base of all the other lakes at a similar depth. The liner was also found to be extending to the banks of the lakes evident in test pits TP34, TP44 and TP52 where the same plastic liner was uncovered just below the surface.

The distribution of the above units is summarised in Table 1 below:

Table 1: Summary of Soil Stratigraphy			
Description	**Depth to top of layer (m)**		
	Minimum	**Maximum**	**Average**
TOPSOIL: SAND / CLAYEY SAND	0.00		
FILL: SAND (UNCONTROLLED)	0.02	0.20	0.11
SAND (SP)	0.10	1.90	1.00
COFFEE ROCK	>2.05		

6.3 Groundwater

A review of the Perth Groundwater Atlas indicates that groundwater levels are likely to be between RL 21m AHD and 26m AHD below existing ground levels. These levels equate to depths of approximately <1m below the lowest existing ground contours along the southern boundary of site.

During the investigation, which was completed in early-summer conditions (Nov/Dec 2020), groundwater was not encountered within any of the investigation locations.

6.4 Permeability

Tabulated results of the 8 in-situ falling head permeability tests carried out was used to estimate the soil coefficient of permeability in accordance with the methods described in Horslev (1951) (falling head test) and CIRIA Report No. 113 (falling head test).

Table summarises the results obtained. Complete results of the in-situ falling head tests are presented in Appendix B.

Table 2: Summary of Falling Head Permeability Tests					
Standpipe ID	**Bottom of Test Hole (mbgl)**	**Approximate Permeability**			
		CIRIA (m/sec)	**CIRIA (m/day)**	**Horslev (m/sec)**	**Horslev (m/day)**
Perm 1	1.36	$3.15x10^{-04}$	27.22	$6.50x10^{-05}$	5.61
Perm 2	1.42	$1.22x10^{-03}$	105.00	$2.99x10^{-04}$	25.84
Perm 3	1.35	$6.73x10^{-04}$	58.18	$1.85x10^{-04}$	16.00
Perm 4	1.38	$4.25x10^{-04}$	36.75	$1.01x10^{-04}$	8.69
Perm 5	1.40	$8.26x10^{-04}$	71.39	$1.99x10^{-04}$	17.16
Perm 6	1.40	$5.05x10^{-04}$	43.61	$1.69x10^{-04}$	14.46
Perm 7	1.41	$3.54x10^{-04}$	30.55	$7.82x10^{-05}$	6.75
Perm 8	1.41	$8.32x10^{-04}$	71.89	$1.87x10^{-04}$	16.13

7 LABORATORY TEST RESULTS

The soil organic content laboratory test results are summarised in Table 3 below.

Table 3: Soil Organic Content Laboratory Results			
Sample ID	**Depth To and From (mbgl)**	**Ash Content (%)**	**Organic Content (%)**
TP04	0.0 – 0.1	95.8	4.2
TP14	0.0 – 0.1	94.7	5.3
TP29	0.0 – 0.1	96.0	4.0
TP41	0.0 – 0.1	91.4	8.6
TP46	0.0 – 0.1	95.6	4.4
TP48	0.0 – 0.1	74.5	25.5
TP23	0.0 – 0.1	94.6	5.4
TP15	0.0 – 0.1	96.7	3.3
Note: TP48 was located at the base of a previous lake which may explain the abnormally high organic content.			

8 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

8.1 General

Following our understanding of the preliminary development plans and our interpreted ground model, we consider that the site is suitable for supporting the proposed residential development, subject to the requirements of AS 2870-2011 and our specific earthworks recommendations detailed in Section 8.2 below.

8.2 Earthworks

Natural and uncontrolled fill sand is expected to be encountered throughout the full depth range of excavations (<1m depth) We anticipate that major cut to fill bulk earthworks will be required to form finished ground levels. This activity is considered appropriate for the site subject to the earthworks construction recommendations described below.

We note earthworks must be carried out in accordance with the recommendations provided in this report and AS3798-2007 *Guidelines on Earthworks for Commercial and Residential Developments*.

8.2.1 Topsoil Strip and Subgrade Preparation

- All vegetation must be stripped and removed from site;
- A 100mm topsoil strip should be considered appropriate for most of the site, however where thick root mats or otherwise unsuitable material is present to a greater depth then this should be removed and cut to waste or reused as fill within the POS areas;
- Existing trees must be removed and their root systems must be completely grubbed out. The soil beneath the root system must be proof rolled and backfilled to the specifications described below;

- Following the topsoil strip, the top 400mm of the soil profile should be tyned to bring any waste / uncontrolled fill to the surface. In some instances, the Earthworks Contractor may be required to excavate deeper to remove all waste / uncontrolled fill. Any organic (tree roots / stumps) or manmade waste observed should be removed from site. Alternatively, the fill material should be stockpiled for reuse as sand fill material following an inspection by a suitably qualified geotechnical engineer; and
- The upper 300mm of the exposed subgrade must be moisture conditioned with a water cart and compacted with a suitable roller to achieve at least 7 blows per 300mm penetration with a Perth Sand Penetrometer (PSP) excluding the top 150mm, which is equivalent to a dry density ratio of at least 95% based on Modified Compaction (AS1289 5.1.1). Any loose, soft, organic or manmade waste materials observed during this proof roll shall be removed and replaced with compacted clean sand fill.

8.2.2 Bulk Earthworks

We recommend the following during bulk earthworks:

- Material must be moisture conditioned with a water cart and compacted in layers not exceeding 300mm with a suitable roller to achieve at least 7 blows per 300mm penetration with a PSP excluding the top 150mm, which is approximately equivalent to a dry density ratio of 95% based on Modified Compaction (AS1289 5.2.1);
- Site won material from proposed cut earthworks is considered suitable for use in bulk earthworks from a geotechnical perspective, subject to adequate placement and providing that similar and consistent fill materials are used for specific applications (i.e. entire fill pads are constructed of similar fill materials); and
- Imported sand bulk fill materials will need to be free of organic or deleterious inclusions with a fines content of less than 5% of the fill volume and a maximum particle size of 100mm. It must be moisture conditioned with a water cart and compacted in layers not exceeding 300mm to achieve at least 7 blows per 300mm penetration with a PSP, which is equivalent to a dry density ratio of 95% based on Modified Compaction (AS1289 5.2.1).

8.2.3 Retaining Wall Backfill

We recommend the following during retaining wall backfilling:

- Backfill layers should be placed in maximum 300mm thick loose layers, moisture conditioned to within ±3% of the optimum moisture content and compacted with a suitable vibrating plate compactor to achieve a dry density ratio of at least 95% based on Modified Compaction (AS1289 5.2.1).

The technical and control requirements for Engineered Fill, including site observation and compaction testing, are outlined in AS3798-2007. We recommend that this work is completed under the direction and control of a suitably experienced Geotechnical Engineer familiar with the contents of this report.

8.2.4 Excavatability

The loose to very dense natural sands and uncontrolled fill sand encountered across the site may be excavated using standard mechanical plant.

8.2.5 Earthworks Monitoring

Variations in ground conditions may occur between test locations. If conditions other than those described above are encountered, then further advice should be sought without delay. During earthworks, site visits should be made by a Geotechnical Engineer or Engineering Geologist who is familiar with the contents of this report to ensure that topsoil stripping is carried out adequately, proof

compaction and cut to fill earthworks are conducted in accordance with AS3798-2007, and to audit the compaction of earthworks. Earthworks control testing should be undertaken in accordance with the guidelines set out in AS3798-2007. CMW would be pleased to perform this function if required.

8.2.6 Lake Remediation and Backfilling

We recommend the following during lake remediation and backfilling:;

- Drain lakes to remove water. Note: Some lakes may require dewatering as the base of the lake is below groundwater;
- Remove all organics and fill material above the liner;
- Remove liner from base of lakes and along embankments; and
- Once the liner has been removed the lakes should be backfilled with clean sand fill or site won material as mentioned in 8.2.2 and compacted in layers not exceeding 300mm to achieve at least 7 blows per 300mm penetration with a PSP, which is equivalent to a dry density ratio of 95% based on Modified Compaction (AS1289 5.2.1). Each layer of fill that is placed should be keyed (fill over cut) into the lake embankments to ensure each layer extends into intact foundation materials.

8.3 Strip and Pad Foundations

The design of available foundation bearing pressures for isolated strip and pad footings with 0.5m or 1.0m embedment depth has been carried out using the Terzaghi bearing capacity equation. Subject to completing the earthworks and foundation preparation recommendations provided in section 8.2 above, shallow strip or pad footings founded within medium dense near surface soils (<1m) or compacted fill material may be designed on the basis of the maximum allowable bearing pressures provided in Table 4.

Table 4: Summary of Shallow Footing Design Bearing Pressure

Embedment Depth (m)	Footing Width (m)	Footing Length (m)	Allowable Bearing Pressure (kPa)	Estimated Settlement (mm)
0.5	0.5 Strip		170	<5
	1 Strip		220	10-15
	1	1	200	5-10
	2	2	290	10-15
1.0	0.5 Strip		280	5-10
	1 Strip		330	15-20
	1	1	310	5-10
	2	2	400	20-25

These values are based on a geotechnical strength reduction factor of 0.5 and an average load factor of 1.5 (Factor of Safety = 3.0). It should be noted that these bearing pressures assume isolated vertical, non-eccentric loads. The assessment has been undertaken based on a static load and does not consider any dynamic or cyclic loading effects. It also does not consider any interaction of closely spaced foundations.

Subject to the earthworks and foundation preparation works being undertaken as described herein, it has been calculated that the total settlements of the footing configurations and design pressures outlined in Table 4 above is unlikely to exceed approximately 20mm to 25mm. Differential settlements are unlikely to exceed approximately one half of these values.

8.4 Retaining Wall Design

Localised cut and fill earthworks will be required along proposed property boundaries for subdivision layout and drainage purposes. All retaining wall footings will be founded on either reworked *in situ* or engineered sand fill material to depths of at least 0.5m. Based on this, recommended retaining wall design parameters are summarised in Table 5 below:

Table 5: Retaining Wall Design Parameters

Soil Unit	Y (kN/m^3)	Ø' (deg)	K_0	E' (MPa)	No wall friction		Wall friction = 2/3Ø	
					K_a	K_p	K_a	K_p
ENGINEERED FILL: SAND (medium dense)	18	34	0.441	60	0.283	3.537	0.254	8.952
SAND (medium dense)	18	34	0.441	60	0.283	3.537	0.254	8.952

Notes:
1. Refer to Table 1 for definition of soil unit levels.
2. Y – soil unit weight; Ø' - angle of internal soil friction; K_0 - coefficient of earth pressure at rest, K_a - coefficient of active earth pressure, K_p - coefficient of passive earth pressure; E' – long term Young's modulus.
3. Values of K_0 are based on initial conditions following construction of the walls.
4. The retaining wall designer must adopt the above set of K_a and K_p parameters relevant to the actual construction method adopted.
5. The above parameters are based on the condition of a horizontal ground surface behind the retaining structure. Applicable surcharge loads behind the wall must also be considered in the design.

Retaining structures should be designed in accordance with AS 4678-2002 "*Earth Retaining Structures*" or an alternate approved factor of safety approach. Should any fill be placed against the permanent retaining walls after construction, it is expected that the compaction induced pressures will be much greater than the above active earth pressures. The compaction equipment used to compact backfill behind the wall must be carefully selected and preferably light-weight compaction equipment should be used. The load on the retaining wall due to compaction equipment may be estimated from Figure J5 in AS4678-2002 *"Earth Retaining Structures".*

It is noted that some ground movement will occur behind temporary or permanent retaining walls. By definition, movement of the wall must occur to fully mobilise the active and passive earth pressure coefficients provided in Table 5 above. The extent of this movement is dependent on the height of retaining wall, type of wall selected and construction methodology. This must be considered during the design and construction of the retaining walls to ensure adjacent facilities are not adversely affected.

Any ground anchors associated with retaining wall construction should be designed on the basis of the above effective stress soil parameters and using appropriate design standards such as BS8081.

8.5 Site Classification

A site classification of CLASS A in accordance with AS2870-2011 is recommended subject to the foundation preparation recommendations provided in Section 8.2 above.

8.6 Environmental

The National Acid Sulfate Soils Map shows that the site is located in a "low to moderate risk area for ASS occurring within 3m of natural surface".

After discussions with Steve Foley (JDSi) during our site walkover, it was mentioned some asbestos may be present across the site following the demolition of old infrastructure. The area in question was along the western boundary of the central precinct by Hartwell Parade. Potential asbestos in the form of an old, fractured pipe was found in the upper 0.5m of this area in TP28 (pictured in the test pit photographs). The same pipe was also found in the upper 1.6m of TP34, on the edge of lake in the southeastern portion of the northern precinct.

During bulk earthworks asbestos will need to be appropriately managed by a competent environmental consultant.

8.7 Pavement CBR

Based on the field density testing undertaken using the PSP and our experience with similar materials, it is recommended that pavements be designed on the basis of a subgrade CBR value of 12% due to the sandy nature of the soils.

This design CBR value is subject to the exposed subgrade being moisture conditioned and compacted in accordance with the recommendations provided in Section 8.2 above. It is recommended that appropriate QA / QC testing be undertaken on subgrade and pavement materials during construction.

8.8 Drainage

It is recommended that soakwells and drainage basins be designed on the basis of a saturated soil coefficient of permeability of 5 m/day subject to them being located a distance of at least 3m away from any structure foundations. This does not allow for any clogging, silting or other design aspects of the soakwells.

9 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use by Eastcourt Property Group in relation to the proposed Glen Iris Estate residential subdivision project in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than Eastcourt Property Group and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

For and on behalf of
CMW Geosciences Pty Ltd

Reviewed by:

Mitchell Owen
Engineering Geologist

Alex Petty
Principal Geotechnical Engineer

Distribution: 1 copy to Eastcourt Property Group (electronic)
Original held by CMW Geosciences Pty Ltd

10 REFERENCES

- Appendix 4, Control of Groundwater for Temporary Works (CIRIA Report No. 113)
- AS 1170, *Structural design actions,* Standards Australia, Sydney, 2007
- AS 1289, *Methods of testing soils for engineering purposes,* Standards Australia, Sydney
- AS 1726, *Geotechnical Site Investigations,* Standards Australia, Sydney, 2017
- AS 2870, *Residential slabs and footings,* Standards Australia, Sydney, 2011
- AS 3798 (inc. amendment 1), *Guidelines on earthworks for commercial and residential developments,* Standards Australia, Sydney, 2007
- AS 4678 (inc amendments 1 & 2), *Earth retaining structures,* Standards Australia, Sydney, 2002
- BS 1377-9:1990 Methods for test for soils for civil engineering purposes. In-situ tests.
- Department of Environment and Conservation (DEC), 2011, Treatment and management of soils and water in acid sulfate soil landscapes, Acid Sulfate Soils Guideline Series.
- *Guide to Residential Slabs and Footings in Saline Environments (CCAA T56),* Cement Concrete & Aggregates Australia, 2005
- Hvorslev J M, *Time lag and soil permeability in ground-water observations,* Bull. 36, 50 pp., U.S. Corps of Eng., Waterways Exp. Sta., Vicksburg, Miss., 1951
- *Perth Groundwater Atlas,* Second Edition, Perth: Department of Environment, 2004
- *Fremantle, Sheet 2033 I & 2033 IV,* Perth Metropolitan Region Environmental Geology Series, Geological Survey of Western Australia, 1986
- Schmertmann, 1970 and Schmertmann et al, 1978.
- Terzaghi, K. (1943). Theoretical soil mechanics. 1st ed. New York: J. Wiley and Sons, Inc.
- WA Online Atlas, Shared Land Information Platform – ASS Risk Map, https://www2.landgate.wa.gov.au/bmvf/app/waatlas/.

Figure

Appendix A

Test Pit Logs, PSP Plots and Photos

TEST PIT LOG - TP01

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392145m N.6446295m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			27.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5 10 15	
						SP: SAND: fine to medium grained, subangular to subrounded; dark grey; trace fines; trace rootlets.		MD to D	6 6 6 5 6 6	
				1			D to M			1.05m: PSP conducted within base of test pit
						... from 1.40m to 1.70m, trace branches		L to MD	1 1 3 2 3 3	
			26.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP02

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392135m N.6446325m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			3	0.00m: test pit located behind retaining wall of lake
						FILL: SAND: fine to medium grained, subangular to subrounded; dark grey; trace fines; trace rootlets.			4	
						... at 0.20m, becoming pale yellow				
			27.6			SP: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.			4	
						... at 0.60m, becoming grey brown with orange			3	
								L to MD	2	
				1			D to M		3	1.05m: PSP conducted within base of test pit
									2	
									1	
									3	
									5	
								MD to D	6	
			26.0	2		Test pit terminated at 2.00 m			4	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP03

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392058m N.6446394m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	0.00m: test pit located behind retaining wall of lake
			27.8			FILL: SAND: fine to medium grained, subangular to subrounded; grey brown; trace fines; trace rootlets; trace organics.			7	
						FILL: SAND: fine to medium grained, subangular to subrounded; black with dark grey; trace fines; trace root and rootlets; trace coffee rock.		MD to D	5	
									6	
						... at 0.90m, no longer rootlets			7	
			27.0	1		SP: SAND: fine to medium grained, subangular to subrounded; grey; trace fines.	D to M	VD	11	
			26.0	2		COFFEE ROCK: fine to medium grained, subangular to subrounded; dark brown; weakly cemented; trace fines.				
			26.0			Test pit terminated at 2.05 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP04

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391978m N.6446343m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.0 - 0.1	D	25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.		MD	4	
			25.7			FILL: SAND: fine to medium grained, subangular to subrounded; orange grey; trace fines; trace rootlets; trace organics.			11	
						FILL: SAND: fine to medium grained, subangular to subrounded; trace gravel; pale yellow; trace fines; trace rootlets; trace cobbles; gravel and cobbles are limestone; trace uncontrolled fill (bricks, rubbish).		D to VD	10	
									8	
			25.2			SP: SAND: fine to medium grained, subangular to subrounded; black with dark grey; trace fines; trace rootlets.			7	
				1		... at 1.10m, no longer rootlets	D to M		10	1.05m: PSP conducted within base of test pit
									4	
									5	
								MD to D	5	
									4	
									4	
			24.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP05

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392208m N.6446432m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	
						SP: SAND: fine to medium grained, subangular to subrounded; dark grey; trace fines; trace rootlets.		D to VD	7	
									7	
									9	
									9	
				1		... at 1.30m, trace branches	D to M		10	1.05m: PSP conducted within base of test pit
									5	
									5	
								D	6	
									5	
									5	
			26.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP06

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392152m N.6446434m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located next to lake
						SP: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets. *... at 0.30m, becoming pale grey*		L	2, 3, 3	
									5, 8, 8	
				1			D to M	D to VD		1.05m: PSP conducted within base of test pit
									3, 5, 6	
								VD	10, 20	
			24.1			COFFEE ROCK: fine to medium grained, subangular to subrounded; black; weakly cemented; trace fines.				
			24.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP07

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392068m N.6446510m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
			26.7			FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets; trace organics. *... at 0.20m, becoming pale grey with orange*			6, 4	
						SP: SAND: fine to medium grained, subangular to subrounded; black with dark grey; trace fines; trace root and rootlets; trace branches. *... at 0.50m, becoming grey*		MD to D	5, 4, 5, 6	
				1			D to M			1.05m: PSP conducted within base of test pit
								L to MD	3, 3, 3, 3, 4, 4	
			25.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP08

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392172m N.6446593m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			28.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
						SP: SAND: fine to medium grained, subangular to subrounded; dark orange with brown; trace fines; trace rootlets.		D	5	
						... at 0.50m, becoming orange			5	
									6	
									5	
				1			D to M		6	
									5	1.05m: PSP conducted within base of test pit
								L to MD	2	
									3	
									3	
									3	
									4	
			27.0	2		Test pit terminated at 2.00 m			3	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP09

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391961m N.6446622m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.				
						SP: SAND: fine to medium grained, subangular to subrounded; grey with black orange; trace fines; trace root and rootlets; trace branches.			5	
									6	
									6	
									5	
						... at 0.80m, no longer branches				
				1			D to M	D to VD		1.05m: PSP conducted within base of test pit
									4	
						... at 1.40m, becoming orange			7	
									8	
									8	
									8	
									9	
			26.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP10

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392112m N.6446693m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			4	
						SP: SAND: fine to medium grained, subangular to subrounded; grey with black orange; trace fines; trace rootlets.			4	
						... at 0.20m, becoming pale grey		D to VD	7	
									10	
						... at 0.80m, becoming orange			9	
				1			D to M		8	1.05m: PSP conducted within base of test pit
									2	
									3	
								L to MD	4	
									4	
									5	
			29.0	2		Test pit terminated at 2.00 m			4	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP11

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392038m N.6446762m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			3	0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets; trace branches.			4	
						... at 0.30m, becoming orange with grey			5	
								MD to D	5	
			30.2			SP: SAND: fine to medium grained, subangular to subrounded; grey and orange; trace fines; trace root and rootlets.			4	
				1		... at 0.90m, no longer roots and rootlets	D to M		4	1.05m: PSP conducted within base of test pit
									5	
									8	
								VD	14	
			29.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP12

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392037m N.6446878m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.0			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	0.00m: test pit located on a green
						FILL: SAND: fine to medium grained, subangular to subrounded; grey with orange; trace fines; trace rootlets.		D to VD	6	
						... at 0.20m, becoming dark grey with black				
			28.6			*... from 0.21m to 0.35m, coffee rock, only found in discrete area*			11	
						SP: SAND: fine to medium grained, subangular to subrounded; orange with grey; trace fines.			20	
				1			D to M			1.05m: PSP conducted within base of test pit
			27.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP13

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392127m N.6446838m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	
						SP: SAND: fine to medium grained, subangular to subrounded; orange with pale grey; trace fines; trace root and rootlets.			7	
						... at 0.40m, becoming grey with orange and black			6	
									8	
									10	
				1			D to M	D to VD	8	1.05m: PSP conducted within base of test pit
						... at 1.20m, becoming black with grey and orange			4	
									7	
									11	
									9	
									8	
			26.0	2		Test pit terminated at 2.00 m			8	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP14

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392214m N.6446932m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.0 - 0.1	D	30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			3	0.00m: test pit located on a tee box
						FILL: SAND: fine to medium grained, subangular to subrounded; dark grey with black; trace fines; trace root and rootlets.			4	
									4	
									5	
									4	
			30.0	1		SP: SAND: fine to medium grained, subangular to subrounded; pale grey with orange; trace fines; trace root and rootlets; trace branches.	D to M	MD to D	4	1.05m: PSP conducted within base of test pit
						... at 1.60m, no longer branches			3	
									4	
									6	
									5	
									6	
			29.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP15

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392112m N.6446995m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.0 - 0.1	D	28.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	0.00m: test pit located on tee box
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.			11	
									12	
			28.5			SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.			12	
						... from 0.60m to 0.80m, becoming black			10	
						... at 0.80m, becoming yellow, no longer rootlets			10	
				1			D to M	D to VD		1.05m: PSP conducted within base of test pit
									4	
									5	
									10	
									22	
			27.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP16

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392205m N.6447054m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.		D to VD	7	
						... at 0.30m, becoming pale yellow			7	
									7	
			29.3			SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.			8	
				1			D to M		7	1.05m: PSP conducted within base of test pit
								L	1	
									1	
									2	
									2	
								D to VD	4	
			28.0	2		Test pit terminated at 2.00 m			8	
				3						

Termination Reason: Target depth reached

Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP17

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392177m N.6447122m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	29.8			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey black; trace fines; trace organics; trace roots and rootlets; trace vegetation.			3	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.			3	
						... at 0.50m, becoming white. Not a homogenous layer			3	
			29.3			SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.			5	
				1			D to M	MD to D	6	1.05m: PSP conducted within base of test pit
									6	
									3	
									3	
									4	
									5	
									6	
			28.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached

Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP18

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392132m N.6447199m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets; trace branches; with some uncontrolled fill (old reticulation pipe, tree roots, bricks).		D to VD	5 5 6 5 5	
			27.1	1		SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines; trace root. ... *at 1.10m, becoming grey*	D to M		7 9 20	1.05m: PSP conducted within base of test pit
			26.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP19

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392209m N.6447301m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			28.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace rootlets.				0.00m: test pit located on green
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with grey; trace fines.			5 10 17	
			28.0	1		SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.	D to M	D to VD	6 8 10 12 16	1.05m: PSP conducted within base of test pit
			27.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP20

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392305m N.6447413m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	
						FILL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey yellow; trace fines; trace rootlets; gravel is limestone.			4	
								D to VD	4	
									6	
			29.2			SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.			11	
				1			D to M		15	1.05m: PSP conducted within base of test pit
			28.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP21

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392233m N.6447425m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			4	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with black; trace fines; trace rootlets.		MD to D	5	
						... at 0.50m, no longer branches			5	
									2	
									2	
				1			D to M		2	1.05m: PSP conducted within base of test pit
								L	1	
									2	
									1	
									1	
									2	
			29.1			SP: SAND: fine to medium grained, subangular to subrounded; orange with grey.			1	
			29.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP22

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392210m N.6447383m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with grey; trace fines; trace rootlets.		MD to D	4 4 5 4 4 3	
						... at 0.70m, no longer rootlets	D to M			
				1						1.05m: PSP conducted within base of test pit
								L	1 1 1 1 1 1 1 1 1	
			29.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP23

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392132m N.6447358m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			28.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on driving range
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.		MD to D	4 3 7	
			28.4			SP: SAND: fine to medium grained, subangular to subrounded; pale grey white; trace fines.		VD	10 12 10	
				1			D to M			1.05m: PSP conducted within base of test pit
								MD to D	3 4 5 5 6	
			27.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP24

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392095m N.6447310m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			29.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace branches; trace vegetation.		MD to D	4, 6, 6, 5, 6, 4	0.00m: test pit located on tee box
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with grey; trace fines; trace rootlets.	D to M			
				1						1.05m: PSP conducted within base of test pit
						... at 1.30m, becoming dark grey		D to VD	6, 9, 10, 7, 6	
			28.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP25

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392026m N.6447373m
Elevation: 32 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			31.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace branches; trace vegetation.		D	5, 6, 6, 7, 7, 7	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with grey; trace fines; trace root and rootlets; trace branches.	D to M			
						... at 0.45m, no longer branches				
				1						1.05m: PSP conducted within base of test pit
								MD to D	2, 4, 5, 4, 5	
			30.1			SP: SAND: fine to medium grained, subangular to subrounded; yellow.				
			30.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP26

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392008m N.6447494m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			3	0.00m: test pit located on driving range
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.			4	
								MD to D	5	
			27.3			SP: SAND: fine to medium grained, subangular to subrounded; pale grey with black; trace fines; trace rootlets.			6	
						... at 0.90m, no longer rootlets			6	
				1			D to M		6	1.05m: PSP conducted within base of test pit
								L	1	
									1	
									3	
								MD	3	
									3	
				2					4	
						... at 2.10m, becoming pale brown				
			25.8			Test pit terminated at 2.20 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP27

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391844m N.6447426m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets; trace branches.			4	
			26.5			SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines.		D to VD	7	
									9	
									10	
				1			D to M		10	1.05m: PSP conducted within base of test pit
									3	
									5	
								MD to D	5	
									5	
									6	
			25.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP28

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391771m N.6447468m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on green
						FILL: SAND: fine to medium grained, subangular to subrounded; grey with pale yellow; trace fines; trace root and rootlets; trace branches; with some uncontrolled fill (tree roots, potential asbestos at 0.5m).	D to M	D to VD	4, 6, 6, 4, 4, 4	
				1						1.05m: PSP conducted within base of test pit
								L	1, 1, 1, 1	
								MD to D	3, 7, 7	
			26.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP29

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391692m N.6447613m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	26.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on tee box
						SP: SAND: fine to medium grained, subangular to subrounded; grey with orange; trace fines; trace rootlets.		MD to D	3, 4, 4	
						... at 0.45m, becoming pale grey				
						... at 0.60m, no longer rootlets			7	
								VD	10, 9	
				1			D to M			1.05m: PSP conducted within base of test pit
									2, 2	
								L to MD	3, 4, 4, 4	
						... at 1.80m, becoming brown orange				
			25.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP30

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391668m N.6447725m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on a mound
						SP: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets.		D to VD	7, 8, 7, 6, 6	
				1		*... from 1.00m to 1.60m, high root content*	D to M		7	1.05m: PSP conducted within base of test pit
									3, 8, 14	
			24.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP31

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391798m N.6447972m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
						SP: SAND: fine to medium grained, subangular to subrounded; dark grey with black; trace fines; trace root and rootlets; trace branches.		D	5, 5, 7	
						... at 0.40m, becoming pale grey			5, 6	
				1		*... at 0.90m, no longer roots, rootlets or branches*	D to M		5	1.05m: PSP conducted within base of test pit
								L	2, 2, 3	
								MD to D	4, 4, 5	
			24.0	2		Test pit terminated at 1.80 m				
				3						

Termination Reason: Test pit walls collapsing
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP32

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391789m N.6447873m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 1.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.0			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; with organics; trace rootlets; trace vegetation.			5	0.00m: test pit located on green
			26.9			FILL: SAND: fine to medium grained, subangular to subrounded; brown orange; trace fines; trace rootlets; trace organics.		D to VD	9	
						SP: SAND: fine to medium grained, subangular to subrounded; orange.			9	
						... at 0.60m, becoming black with grey			9	
									9	
				1		... at 1.00m, becoming grey with black	D to M		8	1.05m: PSP conducted within base of test pit
								L	2	
									4	
									6	
								MD to D	5	
									5	
			25.0	2		Test pit terminated at 2.00 m			6	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP33

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391914m N.6447886m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 1.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.0			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; with organics; trace rootlets; trace vegetation.			5	0.00m: test pit located on green
			28.9			FILL: SAND: fine to medium grained, subangular to subrounded; brown orange; trace fines; trace root and rootlets; trace organics.			7	
						SP: SAND: fine to medium grained, subangular to subrounded; grey with orange.			7	
								MD to D	4	
									4	
				1			D to M		5	1.05m: PSP conducted within base of test pit
									5	
									9	
								VD	10	
									12	
									11	
			27.0	2		Test pit terminated at 2.00 m			12	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP34

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391798m N.6447972m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			26.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; with gravel, coarse grained, subangular to subrounded; with cobbles and boulders, subangular to subrounded (surface); dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.		MD to D	4, 5, 6, 6	0.00m: test pit located next to lake
						FILL: SAND: fine to medium grained, subangular to subrounded; orange brown with black; trace fines; trace rootlets.				0.20m: plastic liner
								VD	8, 10	
				1			D to M			1.05m: PSP conducted within base of test pit
						... at 1.40m, increasing black colouration		VL to L	1, 1, 3	
						... at 1.60m, potential asbestos pipe				
			25.2			Test pit terminated at 1.80 m		D to VD	5, 6, 8	
				2						
				3						

Termination Reason: Test pit walls collapsing
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP35

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391695m N.6447961m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			25.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.		D to VD	6, 8, 12, 17	
						SP: SAND: fine to medium grained, subangular to subrounded; dark grey; trace fines; trace root and rootlets.				
						... at 0.50m, becoming pale grey				
				1			D to M			
				2						
			23.8			Test pit terminated at 2.20 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP36

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391780m N.6448083m
Elevation: 33 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			33.0			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; with organics; trace fines; trace rootlets; trace vegetation.			4	0.00m: test pit located on green
			32.8			FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets; trace organics.			7	
						SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines.		D to VD	10	
						... at 0.70m, becoming pale yellow with orange			10	
									12	
				1			D to M		14	1.05m: PSP conducted within base of test pit
			31.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP37

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391641m N.6448108m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.			8	
						FILL: SAND: fine to medium grained, subangular to subrounded; pale grey orange; trace fines; trace rootlets.		VD	9	
			30.5			SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace rootlets.			10	
									11	
									14	
				1			D to M			1.05m: PSP conducted within base of test pit
			29.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP38

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391687m N.6448201m
Elevation: 40 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			39.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace root and rootlets.		L	3, 2, 3, 3	
			39.2			SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace rootlets.	D to M	MD to D	4, 4	
				1					6	
								VD	13	
			38.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP39

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391604m N.6448263m
Elevation: 39 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			38.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.				0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace rootlets.		D to VD	6, 7, 10, 12, 16	
			38.4			SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines.	D to M			
				1						
			37.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP40

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391717m N.6448301m
Elevation: 37 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			36.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	
			36.7			FILL: SAND: fine to medium grained, subangular to subrounded; orange brown; trace fines; trace rootlets.			6	
						SP: SAND: fine to medium grained, subangular to subrounded; orange with black; trace fines; trace rootlets.			6	
									6	
									6	
				1			D to M	D to VD	7	1.05m: DCP conducted within base of test pit
									5	
									8	
									9	
									9	
									8	
			35.0	2		Test pit terminated at 2.00 m			8	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP41

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391656m N.6448386m
Elevation: 40 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	39.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with black; trace fines; trace rootlets.		D	6	
									6	
									6	
									7	
				1			D to M		7	1.05m: DCP conducted within base of test pit
								L	2	
			38.6			SP: SAND: fine to medium grained, subangular to subrounded; orange with black; trace fines; trace rootlets.			3	
									6	
								D to VD	9	
									15	
			38.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP42

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391769m N.6448368m
Elevation: 36 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			35.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.			5	
			35.7			FILL: SAND: fine to medium grained, subangular to subrounded; orange brown; trace fines; trace rootlets.			7	
						SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace root and rootlets.			14	
				1			D to M	D to VD		1.05m: DCP conducted within base of test pit
									5	
									6	
									6	
									6	
									5	
			34.0	2		Test pit terminated at 2.00 m			6	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP43

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391858m N.6448357m
Elevation: 35 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			34.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.		MD	4	
						FILL: SAND: fine to medium grained, subangular to subrounded; grey orange; trace fines; trace rootlets.			4	
									7	
			34.4			SP: SAND: fine to medium grained, subangular to subrounded; orange with black white; trace fines; trace rootlets.			7	
									8	
				1			D to M	D to VD	12	1.05m: DCP conducted within base of test pit
									7	
									15	
			33.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP44

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391800m N.6448352m
Elevation: 35 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			34.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; with gravel, coarse grained, subangular to subrounded; with cobbles and boulders, subangular to subrounded (surface); dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.		MD	3	0.00m: test pit located next to lake
			34.8			FILL: SAND: fine to medium grained, subangular to subrounded; brown orange; trace fines; trace root and rootlets.			5	0.20m: plastic liner
						SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace rootlets.		D to VD	6	
				1			D to M		9	
									9	
									9	
			33.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP45

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391830m N.6448277m
Elevation: 37 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			36.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.		D	5	0.00m: test pit located on a tee box
						FILL: SAND: fine to medium grained, subangular to subrounded; grey with black; trace fines; trace rootlets.			6	
									6	
			36.4			SP: SAND: fine to medium grained, subangular to subrounded; orange with black white; trace fines; trace rootlets.			7	
				1			D to M		11	
								D to VD	17	1.05m: DCP conducted within base of test pit
									7	
			35.0	2		Test pit terminated at 2.00 m			13	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP46

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391760m N.6448174m
Elevation: 42 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.0 - 0.1	D	41.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.				0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace root and rootlets; trace branches.		MD to D	8, 5, 4	
			41.4			SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace rootlets.	D to M	D to VD	8, 10, 9	1.05m: PSP conducted within base of test pit
				1						
			40.0	2		Test pit terminated at 2.00 m			7, 13	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP47

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392020m N.6447932m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.				
			26.7			FILL: SAND: fine to medium grained, subangular to subrounded; brown orange; trace fines; trace root and rootlets.		D to VD	7, 8, 9, 11	
						SP: SAND: fine to medium grained, subangular to subrounded; white; trace fines; trace root and rootlets.				
						... at 0.90m, becoming orange	D to M			1.05m: DCP conducted within base of test pit
				1				MD to D	3, 4, 5, 6, 6	
			25.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP48

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392002m N.6447829m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	25.9			TOPSOIL: CLAYEY SAND: fine to medium grained, subangular to subrounded; clay, low plasticity; dark grey brown; with organics; trace roots and rootlets; very light, crusted material found at base of lake.	M	VL to L	1, 2, 3	0.00m: test pit located on a previous lake
						FILL: SAND: fine to medium grained, subangular to subrounded; orange brown; trace fines.	W			
			25.5			SP: SAND: fine to medium grained, subangular to subrounded; white; trace fines.			6, 6, 7	0.50m: plastic liner
				1			M	MD to D	3, 5, 6, 7, 7, 7	1.05m: DCP conducted within base of test pit
				2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP49

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392001m N.6447777m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace rootlets.				
						... at 0.70m, becoming pale yellow with black		VD	8, 8, 8, 9, 10	
				1			D to M		9	1.05m: DCP conducted within base of test pit
								MD to D	3, 5, 5, 4, 3	
			26.0	2		Test pit terminated at 2.00 m			4	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP50

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392027m N.6447786m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
			26.8			FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets.				
						SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines; trace root and rootlets; trace branches.				
						... at 0.70m, becoming orange				
				1			D to M	MD to D	5, 4, 5, 4, 4, 4	1.05m: PSP conducted within base of test pit
									3, 4, 5, 5, 6	
			25.0	2		Test pit terminated at 2.00 m			6	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP51

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 7

Logged by: MO
Checked by:AP

Position: E.392051m N.6447678m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets.		D	6, 6, 7, 7, 7, 7	
			26.4			SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines; trace rootlets.				
				1			D to M	L	2, 3	1.05m: PSP conducted within base of test pit
								MD	4, 4	
			25.0	2		Test pit terminated at 2.00 m			11, 11	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP52

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392157m N.6447272m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; with gravel, coarse grained, subangular to subrounded; with cobbles and boulders, subangular to subrounded (surface); dark grey; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.		MD	3	0.00m: test pit located on edge of lake 0.10m: plastic liner on lake embankment
			25.7			SAND: FILL; fine to medium grained, subangular to subrounded; brown orange, trace roots and rootlets.			6	
						SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines; trace root and rootlets.			8	
									8	
							D to M	D to VD	9	
						... at 0.90m, becoming orange			8	
			25.0	1		COFFEE ROCK: fine to medium grained, subangular to subrounded; dark brown; weakly cemented; trace fines.				1.05m: DCP conducted within base of test pit
									4	
								VD	20	
			24.3			Test pit terminated at 1.70 m				
				2						
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP53

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392109m N.6447575m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.			7	
			27.6			SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines; trace root and rootlets.		D to VD	7	
									6	
									7	
							D to M		9	
				1						1.05m: PSP conducted within base of test pit
									4	
									5	
								MD to D	6	
									6	
									6	
			26.0	2		Test pit terminated at 2.00 m			6	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP54

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392112m N.6447508m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			2	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained; dark grey with black; trace fines; trace rootlets.			1 1 1 1 1	
				1			D to M	L		1.05m: PSP conducted within base of test pit
									1	
									1 2	
								MD	4 6	
			28.1			SP: SAND: fine to medium grained, subangular to subrounded; pale grey.			8	
			28.0	2		Test pit terminated at 2.00 m		VD	8	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP55

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392174m N.6447445m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			28.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace rootlets.		D	7 7 7 7	
				1			D to M		6	1.05m: PSP conducted within base of test pit
			27.8			SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines.			3 3	
								MD to D	4 5 6	
			27.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

Appendix B

Permeability Test Results

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate, Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 1	DATE:	3/12/2020
		PROJECT:	PER2020-0452

Specifications - Open-Ended Tube

Length L_1:	1.41	m
Diameter:	80	mm
Non-Perm L_2:		m
Above Gnd L_3:	0.05	m

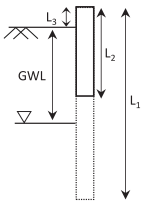
Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h / k_v}$

Bottom of Test Hole: 1.36 m BGL



Hydraulic Conductivity (k)

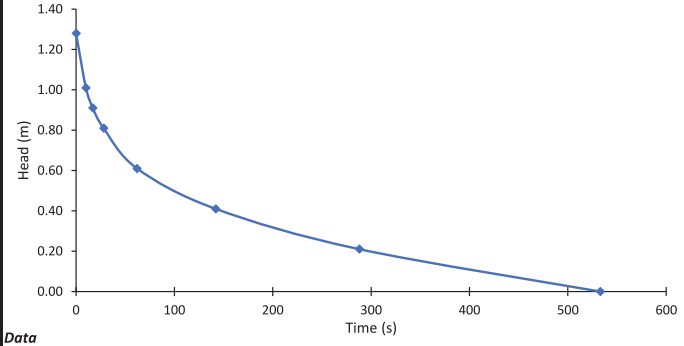
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 3.15E-04 ms^{-1} = 27.22 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 6.50E-05 ms^{-1} = 5.61 m/day



STRATIGRAPHIC LOG
Sand
EOH @ 1.36m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0	0.130	1.280				
10	0.400	1.010	1.145		5.55E-05	4.01E-04
17	0.500	0.910	0.960		3.95E-05	2.49E-04
28	0.600	0.810	0.860		3.02E-05	1.76E-04
62	0.800	0.610	0.710		2.71E-05	1.39E-04
142	1.000	0.410	0.510		1.99E-05	8.19E-05
288	1.200	0.210	0.310		2.44E-05	7.49E-05
533	1.410	0.000	0.105		2.58E-04	1.08E-03

12.00

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 2	DATE:	3/12/2020
		PROJECT:	PER2020-0452

Specifications - Open-Ended Tube

Length L_1:	1.43	m
Diameter:	80	mm
Non-Perm L_2:		m
Above Gnd L_3:	0.01	m

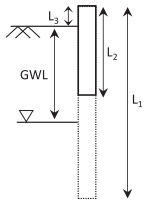
Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.42 m BGL



Hydraulic Conductivity (k)

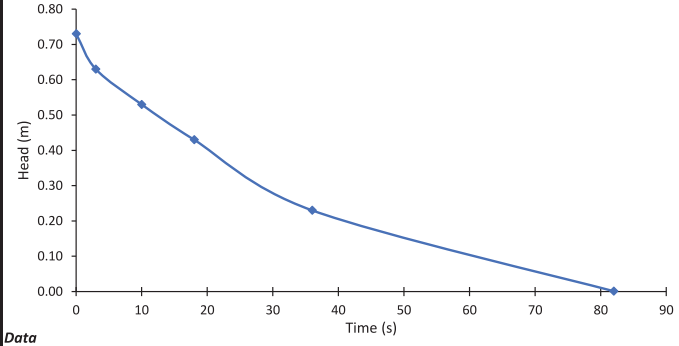
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 1.22E-03 ms^{-1} = 105.00 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2\, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 2.99E-04 ms^{-1} = 25.84 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.42m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.700	0.730					
3	0.800	0.630	0.680		1.64E-04	8.08E-04	
10	0.900	0.530	0.580		9.12E-05	4.03E-04	
18	1.000	0.430	0.480		1.09E-04	4.22E-04	
36	1.200	0.230	0.330		1.79E-04	5.68E-04	
82	1.429	0.001	0.116		9.52E-04	3.87E-03	49.11

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 3	DATE:	3/12/2020
		PROJECT:	PER2020-0452

Specifications - Open-Ended Tube

Length L_1:	1.39	m
Diameter:	80	mm
Non-Perm L_2:		m
Above Gnd L_3:	0.04	m

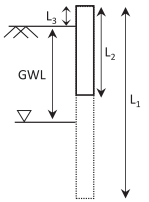
Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.35 m BGL



Hydraulic Conductivity (k)

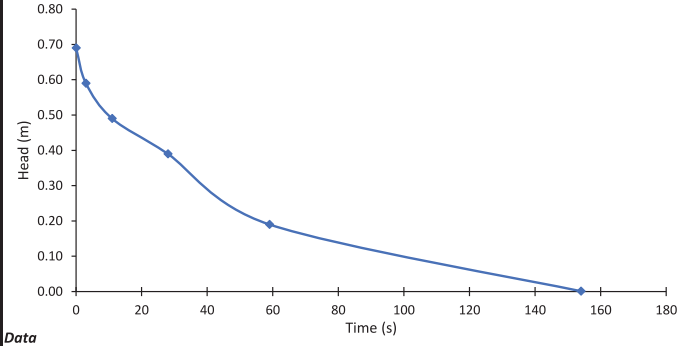
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 6.73E-04 ms^{-1} = 58.18 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2\, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 1.85E-04 ms^{-1} = 16.00 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.35m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.700	0.690					
3	0.800	0.590	0.640		1.81E-04	8.56E-04	
11	0.900	0.490	0.540		8.97E-05	3.77E-04	
28	1.000	0.390	0.440		5.87E-05	2.15E-04	
59	1.200	0.190	0.290		1.28E-04	3.80E-04	
154	1.389	0.001	0.095		4.68E-04	1.54E-03	32.79

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 4	DATE:	3/12/2020
		PROJECT:	PER2020-0452

Specifications - Open-Ended Tube

Length L_1:	1.42	m
Diameter:	80	mm
Non-Perm L_2:		m
Above Gnd L_3:	0.04	m

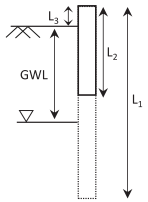
Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.38 m BGL



Hydraulic Conductivity (k)

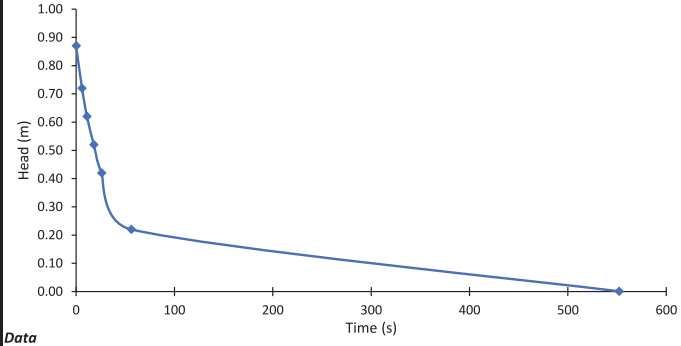
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 4.25E-04 ms^{-1} = 36.75 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2\, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 1.01E-04 ms^{-1} = 8.69 m/day



STRATIGRAPHIC LOG

Fill

EOH @ 1.38m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.550	0.870					
6	0.700	0.720	0.795		9.50E-05	5.25E-04	
11	0.800	0.620	0.670		1.01E-04	4.92E-04	
18	0.900	0.520	0.570		9.39E-05	4.10E-04	
26	1.000	0.420	0.470		1.12E-04	4.30E-04	
56	1.200	0.220	0.320		1.13E-04	3.52E-04	
552	1.419	0.001	0.111		8.87E-05	3.43E-04	

37.18

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 5	DATE:	3/12/2020
		PROJECT:	PER2020-0452

Specifications - Open-Ended Tube

Length L_1:	1.42	m
Diameter:	80	mm
Non-Perm L_2:		m
Above Gnd L_3:	0.02	m

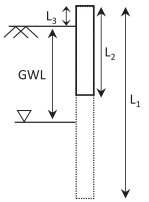
Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.40 m BGL



Hydraulic Conductivity (k)

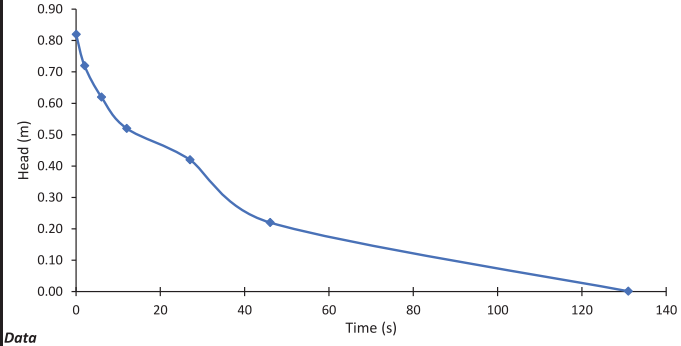
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 8.26E-04 ms^{-1} = 71.39 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2\, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 1.99E-04 ms^{-1} = 17.16 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.4m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.600	0.820					
2	0.700	0.720	0.770		2.00E-04	1.08E-03	
6	0.800	0.620	0.670		1.26E-04	6.15E-04	
12	0.900	0.520	0.570		1.10E-04	4.78E-04	
27	1.000	0.420	0.470		5.99E-05	2.29E-04	
46	1.200	0.220	0.320		1.78E-04	5.56E-04	
131	1.419	0.001	0.111		5.18E-04	2.00E-03	

19.83

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 6	DATE:	3/12/2020
		PROJECT:	PER2020-0452

Specifications - Open-Ended Tube

Length L_1:	1.44	m
Diameter:	80	mm
Non-Perm L_2:		m
Above Gnd L_3:	0.04	m

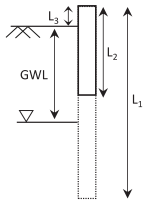
Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.40 m BGL



Hydraulic Conductivity (k)

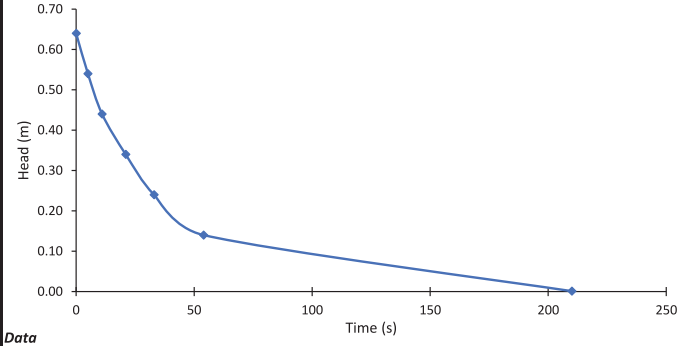
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 5.05E-04 ms^{-1} = 43.61 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} \ln\frac{H_1}{H_2} =$$ 1.67E-04 ms^{-1} = 14.46 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.4m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.800	0.640					
5	0.900	0.540	0.590		1.24E-04	5.55E-04	
11	1.000	0.440	0.490		1.40E-04	5.52E-04	
21	1.100	0.340	0.390		1.21E-04	4.10E-04	
33	1.200	0.240	0.290		1.60E-04	4.51E-04	
54	1.300	0.140	0.190		1.73E-04	3.82E-04	
210	1.439	0.001	0.070		2.86E-04	6.80E-04	

38.92

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 7	DATE:	3/12/2020
		PROJECT:	PER2020-0452

Specifications - Open-Ended Tube

Length L_1:	1.44	m
Diameter:	80	mm
Non-Perm L_2:		m
Above Gnd L_3:	0.03	m

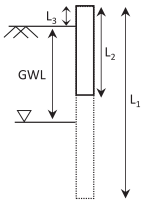
Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.41 m BGL



Hydraulic Conductivity (k)

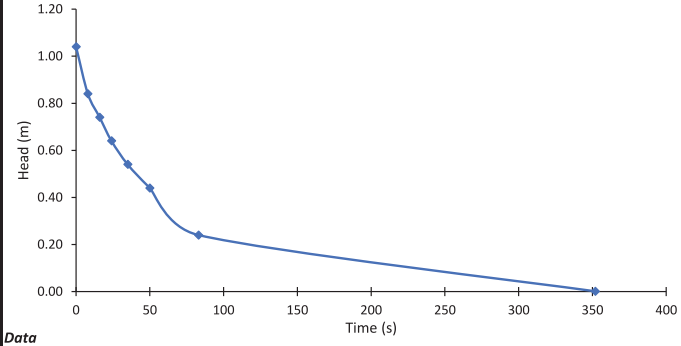
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 3.54E-04 ms^{-1} = 30.55 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} \ln\frac{H_1}{H_2} =$$ 7.82E-05 ms^{-1} = 6.75 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.41m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.400	1.040					
8	0.600	0.840	0.940		7.18E-05	4.48E-04	
16	0.700	0.740	0.790		4.79E-05	2.63E-04	
24	0.800	0.640	0.690		6.00E-05	2.99E-04	
35	0.900	0.540	0.590		5.65E-05	2.52E-04	
50	1.000	0.440	0.490		5.60E-05	2.21E-04	
83	1.200	0.240	0.340		9.31E-05	3.00E-04	
352	1.439	0.001	0.121		1.62E-04	6.92E-04	

21.81

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 8	DATE:	3/12/2020
		PROJECT:	PER2020-0452

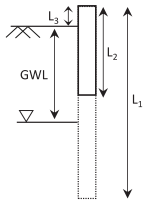
Specifications - Open-Ended Tube

Length L_1: 1.44 m
Diameter: 80 mm
Non-Perm L_2: m
Above Gnd L_3: 0.03 m

Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.41 m BGL



Hydraulic Conductivity (k)

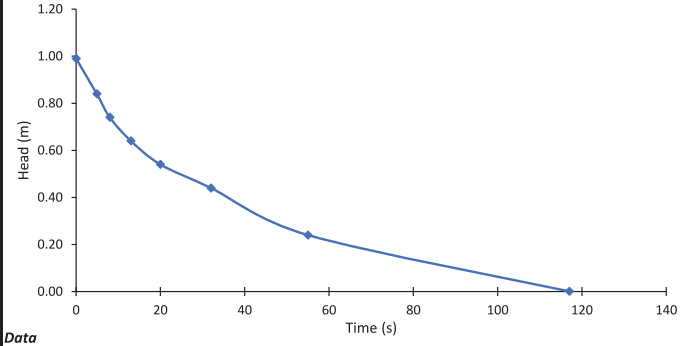
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 8.32E-04 ms^{-1} = 71.89 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2\, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 1.87E-04 ms^{-1} = 16.13 m/day



STRATIGRAPHIC LOG
Sand
EOH @ 1.41m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.450	0.990	0.915		9.18E-05	5.60E-04	
4.9	0.600	0.840	0.790		1.24E-04	6.78E-04	
8	0.700	0.740	0.690		9.60E-05	4.78E-04	
13	0.800	0.640	0.590		8.87E-05	3.97E-04	34.27
20	0.900	0.540	0.490		7.00E-05	2.76E-04	
32	1.000	0.440	0.340		1.34E-04	4.31E-04	
55	1.200	0.240	0.121		7.03E-04	3.00E-03	
117	1.439	0.001					

Appendix C

Laboratory Test Results

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - ASTM D2974-14 (Test Method C)

Client:	CMW Geosciences	*Ticket No.*	S2166
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11347-11354_1_OI
Project:	Geotechnical Investigation	*Sample No.*	WG20/11347-11354
Location:	Glen Iris Golf Course	*Date Sampled:*	Not Specified
Sample Identification:	Various - See Below	*Date Tested:*	4-12-2020

TEST RESULTS - Organic Content

Sampling Method: Sampled by Client, Tested as Received

Testing Completed By: WGLS - KT

Furnace Temperature (^{o}C): 440

Sample Number	Sample Identification	Ash Content (%)	Organic Content (%)
WG20/11347	TP04 0.01m	95.8	4.2
WG20/11348	TP14 0.01m	94.7	5.3
WG20/11349	TP29 0.01m	96.0	4.0
WG20/11350	TP41 0.01m	91.4	8.6
WG20/11351	TP46 0.01m	95.6	4.4
WG20/11352	TP48 0.01m	74.5	25.5
WG20/11353	TP23 0.01m	94.6	5.4
WG20/11354	TP15 0.01m	96.7	3.3

Comments:

Approved Signatory:

Name: Brooke Elliott

Date: 05-December-2020

NATA Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

APPENDIX D
WATER CORPORATION COMMENTARY

Blair Trew

From: Land Planning <LandPlanning@watercorporation.com.au>
Sent: Tuesday, 18 July 2023 9:32 AM
To: Christopher Elms
Subject: RE: SF0009009 RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course
Attachments: Glen_Iris_Golf_Course_plan.pdf

Hi Chris

Thanks for your query below.

From what I can initially see from the updated plan you have provided I can say the information regarding the upgrades previously determined would be still the minimum of what will be required. Unfortunately due to the changes in development density in different locations we will need to undertake a review of our planning and the information we previously provided will need to be checked to see if there are any additional upgrades required. To help with the planning review could you please provide shape files or DWG files of the Indicative Subdivision Concept. I will find out when the review can take place and when we should be able to get back to you. I have included the plan referred to on 30 April 2021 regarding the wastewater upgrades required. But as I said this is the minimum required and we still need to determine if additional upgrades are required.

I'll let you know when we can provide that updated information. I hope to hear from you soon regarding the shape files or DWG files.

Regards

Kevin Purcher
Snr Plnr - Land Planning
Development Services

E Kevin.Purcher@watercorporation.com.au
T (08) 9420 2385

watercorporation.com.au

From: Christopher Elms <Chris.Elms@jdsi.com.au>
Sent: Friday, 14 July 2023 2:10 PM
To: Land Planning <LandPlanning@watercorporation.com.au>
Cc: Blair Trew <blair.trew@jdsi.com.au>; Steven Foley <steven.foley@jdsi.com.au>; Kevin Purcher <Kevin.Purcher@watercorporation.com.au>
Subject: SF0009009 RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course

Hi,

The Structure Plan for the proposed development is progressing and we have been requested to update the Servicing Report for this project to reflect the Water Corps most recent sewer catchments and water supply and any associated funding.

This is quite urgent and as such, your earliest attention to this would be greatly appreciated.

Kind regards,

Chris Elms
Senior Civil Engineer

M: 0432 731 998
P: 08 9227 0595
F: 08 9227 8617

Level 1
432 Murray Street
Perth WA 6000

PO Box 7483
Cloisters Square PO WA 6850

www.jdsi.com.au

From: Kevin Purcher <Kevin.Purcher@watercorporation.com.au>
Sent: Wednesday, 5 May 2021 7:06 AM
To: Steven Foley <steven.foley@jdsi.com.au>
Cc: Blair Trew <blair.trew@jdsi.com.au>; Brett Coombes <Brett.Coombes@watercorporation.com.au>
Subject: RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course

Hi Steven

We have now completed the water scheme review and the following should be noted.

Again there are upgrades required to our headworks infrastructure including distribution mains. But the Water Corporation will undertake them when required at our expense.

A new DN150 reticulation main from the Berrigan Drive DN500 distribution main for water servicing South of Berrigan Drive is required. This new main would be required to be integrate into the existing reticulation system during the subdivision stage. (see sketch below)

If you have any further queries please don't hesitate to ask.

Regards

Kevin Purcher
Snr Plnr - Land Planning
Development Services

E Kevin.Purcher@watercorporation.com.au
T (08) 9420 2385

watercorporation.com.au

From: Kevin Purcher
Sent: Friday, 30 April 2021 3:28 PM
To: Steven Foley <steven.foley@jdsi.com.au>
Cc: Blair Trew <blair.trew@jdsi.com.au>; Brett Coombes <Brett.Coombes@watercorporation.com.au>
Subject: RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course

Hi Steve

Sorry but we have only just finalised the Wastewater review and are still awaiting the finalisation of the water scheme review. Please note the following.

Water – still to be provided

Wastewater
Glen Iris Golf Course is currently within both Bibra Lake and Jandakot Sewer Districts. Based on the existing contours, a small area northeast of the golf course (highlighted in yellow on the attached plan), which is currently included in Bibra Lake SD, will be changed to Jandakot SD, and would be served by Glenbawn Dr SPS instead of Virgilia Tce SPS. That may affect how the development is serviced.
There are numerous upgrades required to our downstream headworks infrastructure including collection sewers, pump stations and pressure mains. But the Water Corporation will undertake them when required at our expense.
As a result of the proposed development there is a retic sewer that is downstream of the development that needs to be upgraded when development takes place. 825m of existing DN225 retic sewer from manhole number T9948 to S0697 needs to be upgraded to DN300. (refer to plan attached) This will need to be undertaken by the developer at the developers expense as part of the future development (subdivision) process.

If you have any queries please don't hesitate to contact me.

Regards

Kevin Purcher
Snr Plnr - Land Planning
Development Services

E Kevin.Purcher@watercorporation.com.au
T (08) 9420 2385

watercorporation.com.au

From: Steven Foley <steven.foley@jdsi.com.au>
Sent: Thursday, 29 April 2021 6:13 PM

To: Kevin Purcher <Kevin.Purcher@watercorporation.com.au>
Cc: Blair Trew <blair.trew@jdsi.com.au>; Brett Coombes <Brett.Coombes@watercorporation.com.au>
Subject: RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course

Hi Kevin,

Just following up on the below. JDSi's report is due cob tomorrow so hoping to get the updated planning advice on the upgrades prior to then.

Regards,

Steven Foley
DIRECTOR

M: 0411 153 087
P: 08 9227 0595
F: 08 9227 8617

Level 1
432 Murray Street
Perth WA 6000

PO Box 7483
Cloisters Square PO
WA 6850

JDSi CONSULTING ENGINEERS

www.jdsi.com.au

From: Steven Foley
Sent: Wednesday, 14 April 2021 1:20 PM
To: Kevin Purcher <Kevin.Purcher@watercorporation.com.au>
Cc: Blair Trew <blair.trew@jdsi.com.au>; Brett Coombes <Brett.Coombes@watercorporation.com.au>
Subject: RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course

Hi Kevin,

Answers below in green.

Regards,

Steven Foley
DIRECTOR

M: 0411 153 087
P: 08 9227 0595
F: 08 9227 8617

Level 1
432 Murray Street
Perth WA 6000

PO Box 7483
Cloisters Square PO
WA 6850

JDSi CONSULTING ENGINEERS

www.jdsi.com.au

From: Kevin Purcher <Kevin.Purcher@watercorporation.com.au>
Sent: Wednesday, 14 April 2021 11:56 AM
To: Steven Foley <steven.foley@jdsi.com.au>
Subject: RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course

Hi Steven

Sorry for not getting back to you I thought I had. We will try our best to have it completed by the end of April. But how close I'm not sure. Is there an actual date? Would it be an issue if we could only reply by say the first week of May? The LSP is aiming to be lodged in the first week of May so we would ideally like it no later than Fri 30th April.

With your question about any issues, are you referring to upgrades of mains and other infrastructure? Yes this is correct If so until we have the review complete it is difficult to answer. The simple answer would be if there are upgrades required for reticulation works then the developer would pay and arrange them. Noted But if there are upgrades to headworks items then funding of them needs to be determined depending on what they are. Noted

I hope that helps. Please ask if you have a query.

Regards

Kevin Purcher
Snr Plnr - Land Planning
Development Services

E Kevin.Purcher@watercorporation.com.au
T (08) 9420 2385

watercorporation.com.au

From: Steven Foley <steven.foley@jdsi.com.au>
Sent: Tuesday, 13 April 2021 5:02 PM
To: Kevin Purcher <Kevin.Purcher@watercorporation.com.au>
Cc: Blair Trew <blair.trew@jdsi.com.au>; Brett Coombes <Brett.Coombes@watercorporation.com.au>
Subject: RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course

Hi Kevin,

Are you able to provide any updates on the below? Have the planners had a chance to look into this? JDSi need to have our servicing report completed by the end of April and I would ideally like to have some confirmation from the WC that we don't have any issues – if we do, what we can do to resolve them down the track.

Regards,

Steven Foley
DIRECTOR

M: 0411 153 087
P: 08 9227 0595
F: 08 9227 8617

Level 1
432 Murray Street
Perth WA 6000

PO Box 7483
Cloisters Square PO
WA 6850

www.jdsi.com.au

From: Kevin Purcher <Kevin.Purcher@watercorporation.com.au>
Sent: Tuesday, 30 March 2021 3:01 PM
To: Steven Foley <steven.foley@jdsi.com.au>
Subject: RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course [Filed 30 Mar 2021 15:29]

Thanks for the update Steven.

I will be finding out when those reviews will be able to take place and then I will let you know as soon as I can.

Regards

Kevin Purcher
Snr Plnr - Land Planning
Development Services

E Kevin.Purcher@watercorporation.com.au
T (08) 9420 2385

watercorporation.com.au

From: Steven Foley <steven.foley@jdsi.com.au>
Sent: Tuesday, 30 March 2021 2:49 PM
To: Kevin Purcher <Kevin.Purcher@watercorporation.com.au>
Cc: Blair Trew <blair.trew@jdsi.com.au>; Brett Coombes <Brett.Coombes@watercorporation.com.au>
Subject: RE: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course

Thanks Kevin,

Given we are submitting a servicing report to support the LSP we are probably going to need some more definitive answers in regards to any water/sewer upgrades required. Given the highly sensitive nature of the project any gaps will be scrutinised. To assist receiving these more definitive answers I can advise (based on the current plan) the following:

Water – number of lots is 408. The number of dwellings is 550.

Sewer – the proposed flows from the entire development based on the number of dwellings is approx 5.5l/s.

In regards to timing, it is likely a WAPC application will be lodged within 12mths. I would suggest it will then be at least another 18mths from receipt of the WAPC approval that first water/sewer may be required.

If you need anything further please call, alternatively happy to come in and have a meeting.

Regards,

Steven Foley
DIRECTOR

M: 0411 153 087
P: 08 9227 0595
F: 08 9227 8617

Level 1
432 Murray Street
Perth WA 6000

PO Box 7483
Cloisters Square PO
WA 6850

www.jdsi.com.au

From: Kevin Purcher <Kevin.Purcher@watercorporation.com.au>
Sent: Tuesday, 30 March 2021 1:56 PM
To: Steven Foley <steven.foley@jdsi.com.au>
Subject: L 509 No 76 Dean Road Jandakot - Glen Iris Golf Course

Hi Steven

Thank you for your request for servicing information regarding the above location. We offer the following comments in regards to the proposal.

Water
Reticulated water is currently available to the subject area. Due to the increase in lots being developed, upgrading of the current system may be required to prevent existing customers being affected by the proposed development. A review of our scheme planning will be required to determine what upgrades will be required. If you are able to provide more detail of demands required that will help with the review. Timing of the review is currently unknown but we will look at the current planned work to be undertaken and let you know where it can be fitted in.
Existing water mains are located within the subject area. Pressured water mains shall not be located in private land and should be located in and protected by reserves (i.e. road reserves) as no development would be allowed in this area. The developer is required to fund the full cost of protecting, relocating or modifying any of the existing infrastructure which may be affected by the above proposal.

Water Source
The subject area falls within the Jandakot Underground Water Pollution Control Area (UWPCA). Developers within a UWPCA need to fulfill their legal responsibilities including those covering 'land use' planning, environmental, health and building permit matters. The Department of Water and Environmental Regulation is responsible for managing and protecting Western Australia's water resources. The subject area is also affected by several 300m Wellhead Protection Buffers. These buffers are declared to protect the quality of

groundwater being extracted for drinking water. In these zones groundwater moves rapidly towards wells and any surface contamination moving through the soil could find its way into scheme water supplies. Activities and land uses in these areas are restricted and subject to the Department of Water and Environmental Regulation approval processes in accordance with the Western Australian Planning Commissions current State Planning Policy 2.7.

Sewer
Reticulated wastewater is currently available to the subject area. Due to the increase in lots being developed, upgrading of the current system may be required. A review of our scheme planning will be required to determine what upgrades will be required. If you are able to provide more detail of the additional flows being created that will help with the review. As per above the timing of the review is currently unknown but we will look at the current planned work to be undertaken and let you know where it can be fitted in.
It should be noted that existing sewerage mains are located within the subject land. Due consideration will be required when developing in these areas. The developer is required to fund the full cost of protecting or modifying any of the existing infrastructure which may be affected by the proposed development.

The developer is expected to provide all water and sewerage reticulation. A contribution for Water and Sewerage headworks will also be required. In addition the developer may be required to fund new works or the upgrading of existing works and protection of all works.

Water Corporation easements are located in the development area. This proposal will require our Procurement and Property Branch approval prior to any development taking place.

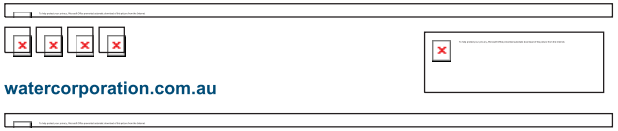
The information provided above is subject to review and may change. If the proposal has not proceeded within the next 12 months, please contact us to confirm that this information is still valid.

Should you have any queries or require further clarification on any of the above issues, please do not hesitate to contact me.

Regards

Kevin Purcher
Snr Plnr - Land Planning
Development Services

E Kevin.Purcher@watercorporation.com.au
T (08) 9420 2385



APPENDIX E
MOBILE BLACK SPOT PROGRAM COMMENTARY

Blair Trew

From: Blair Trew
Sent: Tuesday, 22 February 2022 10:47 AM
To: 'mobile coverage'
Subject: RE: Automatic reply: Mobile Black Spot Program - Berrigan Drive, Jandakot WA [SEC=OFFICIAL] [Filed 22 Feb 2022 10:46]
Attachments: JDS201817_SK101-DEV AREA.pdf; JDS201817_SK100-DEV AREA.pdf; ECM_8029590_v6_Structure-Plans-Telecommunications-Infrastructure-LPP5.pdf

Hi Mobile Black Spot Program Team,

A residential and commercial land development project is proposed in the area of Berrigan Drive, Jandakot (Western Australia). The development is currently progressing through a Local Structure Planning process.

The development will consist of approximately 550 residential dwellings, a small local retail lot and public open space. Attached plans show the development area (in yellow).

The development is located within the City of Cockburn and I have attached a copy of their Local Planning Policy LPP5.19 relating to "Structure Plans & Telecommunications Infrastructure".

In order to comply with this policy we are seeking feedback with regards to:

- Telecommunications network coverage, capacity and quality for the subject area.
- Any above ground telecommunications infrastructure currently proposed for the area.
- Any future requirements for above ground telecommunications infrastructure to support the proposed development and surrounding community.

Should you require any further information please don't hesitate to contact the undersigned.

Regards,

Blair Trew
ENGINEERING MANAGER

M: 0423 329 157
P: 08 9227 0595
F: 08 9227 8617

Level 1
432 Murray Street
Perth WA 6000

PO Box 7483
Cloisters Square PO
Perth WA 6850

JDSi CONSULTING ENGINEERS

www.jdsi.com.au

From: mobile coverage <mobilecoverage@communications.gov.au>
Sent: Tuesday, 22 February 2022 10:41 AM
To: Blair Trew <blair.trew@jdsi.com.au>
Subject: Automatic reply: Mobile Black Spot Program - Berrigan Drive, Jandakot WA [SEC=OFFICIAL]

Mobile Black Spot Program

Thank you for your email regarding the Mobile Black Spot Program.
This is an automatically generated email which provides answers to frequently asked questions.

If this information does not address your specific concerns, please reply to this email and a member of the Mobile Black Spot Program team will respond to you shortly.

Round 5

In April 2020, the Minister for Communications, Cyber Safety and the Arts, The Hon Paul Fletcher MP, together with the Minister for Regional Health, Regional Communications and Local Government, The Hon Mark Coulton MP, announced the results of the Round 5 competitive assessment process.

Round 5 is funding the 182 new mobile base stations which will address coverage issues across regional and remote Australia, including 33 base stations that specifically target Public Interest Premises such as economic centres and emergency services facilities. For further information about Round 5 see the Mobile Black Spot Program's FAQs page.

Round 5A

The Government is proposing to run an additional Round 5A of the Program. This Round will use the uncommitted Round 5 funds to continue to expand and improve mobile coverage for regional and remote Australia.

In April 2020 the Government released a discussion paper seeking feedback from industry and community on options for the design of this next round of the Program. Further information can be found on the Round 5A 'Have your say' page, Consultation on design options for Round 5A of the Mobile Black Spot Program.

Frequently asked questions:

1. **I don't have mobile coverage, or the mobile coverage that I have isn't reliable. What can I do about it?**
2. **I've heard there is a Mobile Black Spot Database. Can I nominate my area?**
3. **What is the Mobile Black Spot Program?**
4. **What is the Mobile Black Spot Program doing in my area?**
5. **Why hasn't my area been selected for mobile coverage improvement?**
6. **What are Public Interest Premises, and how are they nominated?**
7. **How do I contact the mobile carriers about my mobile coverage issues?**

1. I don't have mobile coverage, or the mobile coverage that I have isn't reliable. What can I do about it?

Be aware that there are a range of factors that affect reception

There are a number of local factors that can interfere with mobile reception and therefore impact a user's ability to obtain or maintain a mobile phone signal at any given time or place. These factors include mountainous or hilly terrain, buildings (including their internal structure) or other physical obstacles interrupting the line-of-sight from the mobile base station.

Check the coverage maps for your mobile carrier and shop around to see which carrier has the best coverage in your area

The mobile carriers publish their coverage mapping information on their websites:

- *Optus:* www.optus.com.au/shop/mobile/network/coverage
- *Telstra:* www.telstra.com.au/coverage-networks/our-coverage
- *Vodafone:* www.vodafone.com.au/network/coverage-checker

Ensure your mobile handset suits your local conditions

The particular handset used can also affect mobile reception. Each of the mobile phone providers are able to provide advice on the best handsets for local conditions. For example, Telstra uses a 'blue tick' label on the phones it recommends for use in poor coverage areas. Optus has also recently announced their 'Top Picks for Regional Coverage' device rating program, enabling consumers to choose mobile phones that will work best on the Optus regional network.

Consider products which can improve reception

New products to improve mobile reception are regularly released. For example, Telstra has released a 'Smart Antenna' to improve indoor reception on its network, and Optus has released an app which allows its customers to receive calls and texts over a Wi-Fi connection. Another effective way to improve reception is to use an external antenna or in-car kit. The most appropriate antenna may depend upon the network, and prices can vary. These accessories can be readily obtained from mobile phone shops and dealers.

Check the rollout schedule for the Mobile Black Spot Program to see if a mobile base station is being deployed in your area

Information about the expected timing of the rollout of the 1047 mobile base stations funded under the Mobile Black Spot Program is available on Optus, Telstra and Vodafone's websites:

- *Optus:* www.optus.com.au/shop/mobile/network/mobile-black-spot-program
- *Telstra:* www.telstra.com/blackspots
- *Vodafone:* www.vodafone.com.au/red-wire/vodafone-mobile-black-spot-investment

The rollout sequence is being determined by the mobile carriers based on various factors, including obtaining local government planning approval, landowner agreement where necessary, and access to existing infrastructure, power and backhaul.

Consider the use of Satellite Phones

It is also important to realise that for people living, working and travelling in areas where there is poor or no mobile coverage, alternative devices, such as low cost satellite personal location beacons (PLBs) and/or satellite phones, should be considered in case of an emergency. These devices are readily available from a number of providers and can operate across the entire Australian landmass.

Contact your mobile provider to let them know that you have poor coverage, and that there is demand for improved mobile coverage in your area.

Contact details for the mobile network operators are included at the end of this email.

2. I've heard there is a Mobile Black Spot Database. Can I nominate my area?

The Department previously accepted nominations of mobile black spot locations for inclusion on the Mobile Black Spot Database, however the nomination period closed in October 2018. New nominations are not being accepted at this time.

The Database is available to view on the National Map. The purpose of the database is to assist mobile network operators to identify areas with mobile black spots when applying for funding under the

Mobile Black Spot Program. However, a location does not need to be on the database to be eligible for funding under the current round. Mobile network operators may still apply to construct a mobile base station in areas which are not on the database.

If your broader geographic area is not listed on the Database, you can contact your local council or mobile provider to make them aware of your mobile coverage concerns. Contact details for the mobile network operators are at the end of this email.

3. What is the Mobile Black Spot Program?

The Mobile Black Spot Program (the Program) is the Australian Government's initiative to extend mobile coverage and competition in regional and remote Australia. The Government has committed $380 million to the Program to invest in telecommunications infrastructure to improve mobile coverage and competition across Australia.

This Program is supported by co-contributions from state and local governments, mobile network operators (Optus, Telstra and Vodafone), businesses and local communities.

Under the first five rounds of the Program, the Government's commitment has generated investment of more than $836 million, funding a total of 1,229 new base stations across Australia. The indicative locations of these base stations can be viewed on the National Map.

Further information on the Mobile Black Spot Program, including lists of the base stations funded under the first four rounds of the Program is available on the department's website.

4. What is the Mobile Black Spot Program doing in my area?

The indicative locations of the 1,229 mobile base stations funded under the Program can be viewed on the National Map. Information about the expected timing of the rollout is available on Optus, Telstra and Vodafone's websites:

- *Optus:* www.optus.com.au/shop/mobile/network/mobile-black-spot-program
- *Telstra:* www.telstra.com/blackspots
- *Vodafone:* www.vodafone.com.au/red-wire/vodafone-mobile-black-spot-investment

The rollout sequence is being determined by the mobile carriers based on various factors, including obtaining local government planning approval, landowner agreement where necessary, and access to existing infrastructure, power and backhaul.

5. Why hasn't my area been selected for mobile coverage improvement?

In order to be selected for mobile coverage improvement, a base station must be included in an application from an eligible applicant (i.e. Mobile Network Operators or Mobile Network Infrastructure Providers) under the Program. All base stations included in applications are then assessed against the assessment criteria included in the Program Guidelines for that funding round.

Areas which have not been selected for improved mobile coverage to date are either ineligible, have not been included in an application from an eligible applicant, or the proposed base station was not assessed as delivering value for money to the Commonwealth (for instance due to offering minimal new coverage).

6. What is a Public Interest Premises and how are they nominated?

A Public Interest Premises is defined as a premises or location that the Program considers is used on a continuing basis for a public interest purpose, and which may include:

- an economic centre;
- an emergency services facility;
- a health facility;
- an educational facility;

- **an indigenous community organisation;**
- **a local government facility; or**
- **a not-for-profit organisation.**

Public Interest Premises are nominated by applicants in their applications. Applicants are required to provide evidence of support or endorsement by the relevant oversight organisation or governing body as part of their application.

7. How do I contact the mobile carriers about my mobile coverage issues?

Telstra
Mobile coverage report system
https://service.telstra.com.au/customer/general/forms/coverage-feedback

Optus
Customer Service: 133 937
www.optus.net.au

Vodafone
Community Relations: 1300 302 703
communityrelations@vodafone.com.au
www.vodafone.com.au

Regards
Mobile Black Spot Program Team
www.communications.gov.au/mbsp
Department of Communications and the Arts
GPO Box 2154 Canberra ACT 2601