



Douglas Partners
Geotechnics | Environment | Groundwater

Report on
Preliminary Geotechnical Investigation

Proposed Residential Development
Lot 1 DP 798111, North Bungendore

Prepared for
Queanbeyan - Palerang Regional Council

Project 88336.01
March 2018

Integrated Practical Solutions



Document History

Document details

Project No.	88336.01	Document No.	R.001.Rev0
Document title	Report on Preliminary Geotechnical Investigation Proposed Residential Development		
Site address	Lot 1 DP 798111, North Bungendore		
Report prepared for	Queanbeyan - Palerang Regional Council		
File name	88336.01.R.001.Rev0		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Draft A	Alexandra Radulovich	Michael Jones	27/06/2017
Draft B	Michael Jones	Colin Reid	05/07/2017
Revision 0	Alexandra Radulovich	Michael Jones	06/10/2017

Distribution of copies

Status	Electronic	Paper	Issued to
Draft A	1	0	Sue Robb
Draft B	1	0	Sue Robb
Revision 0	1	0	Sue Robb

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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Author	 for A. Radulovich	06/10/2017
Reviewer		06/10/2017



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Report on Preliminary Geotechnical Investigation

Proposed Residential Development

Lot 1 DP 798111, North Bungendore

1. Introduction

This report presents the results of a preliminary geotechnical investigation undertaken for a planning proposal seeking rezoning of the land for residential and other purposes at Lot 1 DP 798111, North Bungendore. The investigation was commissioned in a letter dated 25 July 2017 by Mr John Wright of Queanbeyan - Palerang Regional Council and was undertaken in accordance with Douglas Partners' proposal CAN160054 dated 21 April 2016. It is understood that this report will support the planning proposal for the proposed development of the site as a residential estate (i.e. a low density residential land use).

Site investigation was carried out to provide information on subsurface conditions with preliminary comments given on site classification, site preparation measures, excavation conditions, the performance of suitable foundation systems, likely bearing pressures, pavement design parameters and likely geotechnical constraints.

The investigation comprised test pit excavation with in-situ testing and sampling of the subsurface strata, followed by laboratory testing, engineering evaluation and analysis. Details of the work undertaken are given in the report, together with comments relating to design and construction practice.

It is noted that the investigation was undertaken concurrently with a preliminary site investigation (PSI) for soil contamination assessment purposes (Project 88336.02).

This report must be read in conjunction with the attached notes "About This Report" which are included in Appendix A.

2. Site Description

The site comprises an irregular shaped area of around 80 hectares with maximum north-south and east-west dimensions of 2 km and 0.5 km, respectively. The site is bounded by Tarago Road to the west, residential properties to the south, a railway line to the southeast, and a municipal landfill (Bungendore Landfill Facility)/waste transfer centre and arable farmland to the north. DP understands that the Bungendore Landfill Facility currently remains partially open.

A locked shed, two animal shelters and a concrete slab with scattered bricks and rubble, which is understood to be covering a recently demolished toilet, were noted in the south western portion of the site near to the entrance off Tarago Road. Mature trees are located around the structures and along the western, southern and part of the northern boundaries of the site. Four dams are located on the site with three intermittent creeks entering the site generally in a north to south orientation, two of

these creeks pass through dams, with some erosion at their location is evident (See Figure 1). A fourth creek line crosses through the site in the north eastern corner.

With the exception of the westernmost paddock which is relatively flat, the site comprises a number of hill tops along the northern boundary with wide gullies in between (see Figure 2). A local topographical high point is located immediately to the north of the central portion of the site. The site slopes generally to the south to southwest, and to the west in the western portion of the site, from 750 mAHD to 700 mAHD.



Figure 1: View south of some erosion evident at the base of an intermittent creek entering one of the farm dams.



Figure 2: View east of the north-western corner of the westernmost paddock with a hilltop in the adjacent paddock visible in the background.

3. Regional Geology

Reference to the 1:100 000 Geological Series Sheet for Canberra (Ref 1) indicates that the site is underlain by five geological units which are shown on the extract and described below.

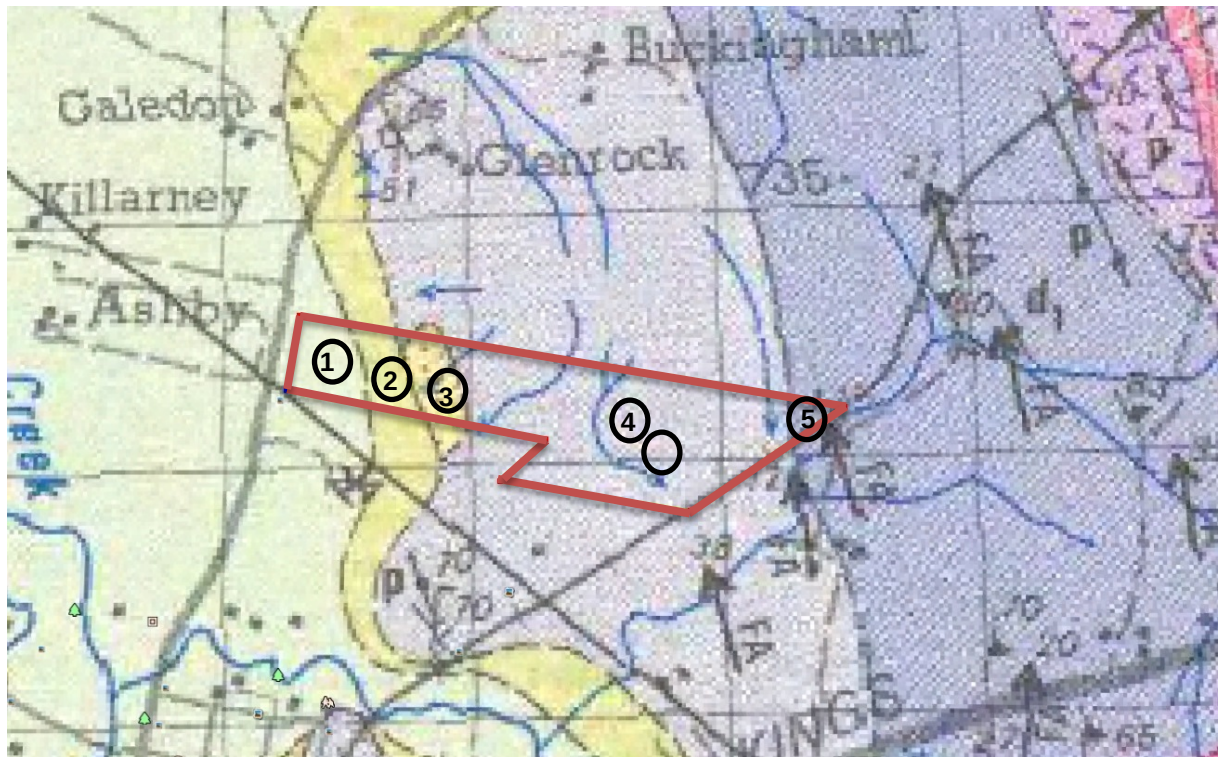


Figure 3: Extract of Geology Map with approximate site extent shown in red.

1. **Quaternary Alluvium:** gravel, sand, silty clay and black organic clay.
2. **Quaternary Colluvium:** fanglomerate, poorly cemented conglomerate, gravel and sand.
3. **Quaternary Aeolian:** fine quartz sand.
4. **Birkenburn Beds:** (middle to late Ordovician age), interbedded sandstone, siltstone and shale.
5. **Unnamed Birkenburn Beds Subgroup:** (middle to late Ordovician age), psammo-pelitic schist and pelitic schist.

The subsurface investigation confirmed the presence of sand and gravel soils over the western part of the site and where encountered, shale, siltstone and sandstone bedrock.

4. Field Work Methods

The field investigation comprised the excavation of 40 test pits (Pits 1 – 40) to depths ranging from 1.1 – 4.1 m using a Kubota KX057-4 mini excavator fitted with a 300 mm wide bucket working under the direction of an experienced geotechnical engineer. Disturbed and bulk samples of the soils were

collected for laboratory testing and to assist in strata identification. The approximate test locations are shown on Drawing 1 (Appendix B) and were located onsite using a hand held GPS unit which is accurate to around 5 m. Survey data to ascertain surface levels had not yet been undertaken at the site. Once it has been undertaken and received from the client, updated logs with RL's will be issued.

5. Field Work Results

Details of the subsurface conditions encountered are given in the test pit logs included in Appendix C which must be read in conjunction with included explanatory notes that define classification methods and terms used to describe the soils and rocks. In summary, the field testing encountered variable subsurface conditions underlying the site with the principal succession of strata broadly summarised as follows:

- **TOPSOIL:** generally comprising silty sand, sandy silt and silt topsoil with rootlets to depths of 0.1 – 0.3 m. Topsoil filling was encountered in Pit 32 m to 0.6 m depth with natural remnant topsoil then underlying the filling from 1.1 – 1.3 m depth.
- **FILLING:** generally comprising sandy or clayey soils with varying amounts of silt and gravel in Pits 25 and 31 – 34 to depths of 0.1 – 1.1 m. It is noted that the filling in Pit 25 was surficial and associated with dam embankments in the other pits.
- **SAND/GRAVEL:** variably very loose to very dense moist to dry sand and gravel with varying amounts of clay and silt in to 0.4 – 2.7 m depth in Pits 1 – 8, 10, 15, 19, 20, 24, 26 and 29 and to the limit of investigation depths of 2.6 – 3.7 m in Pits 25, 27 and 30 and 1.1 m in Pits 35 – 40.
- **CLAY/SILT:** variably soft to hard, wet to dry, low to high plasticity clay and silt with varying amounts of sand and gravel to 1.0 – 3.5 m in Pits 3 – 5, 7 – 10, 12 – 17, 20 – 23 and 30 – 32 and to the limit of investigation depths of 2.5 – 3.1 m in Pits 6, 11, 18, 26, 28, 33 and 34.
- **Bedrock:** variably extremely low to high strength, extremely to slightly weathered siltstone, shale and sandstone bedrock in Pits 1 – 5, 7 – 10, 12 – 17, 19 – 24, 27, 29, 31 and 32 below depths of 1.0 – 2.7 m to termination depths of 1.6 – 3.5 m. Table 1 below provides more details on the bedrock strength and termination depths.

Table 1 – Summary of Bedrock Conditions

Pit No.	Depth to Extremely Low to Very Low Strength Rock	Depth to Low Strength Rock	Medium High to Strength Rock	Termination Depth (m)(Reason)
1	1.7	NE	NE	2.5 (LOI)
2	2.1	NE	NE	2.5 (LOI)
3	NE	1.0	1.4	1.6 (Refusal)
4	1.5	1.9	2.2	2.3 (LOI)
5	1.3	2.3	NE	2.6 (Slow Progress)
6	Bedrock Not Encountered			2.6 (LOI)
7	2.4	NE	NE	2.6 (LOI)
8	NE	2.3	NE	2.6 (Slow Progress)
9	NE	1.6	NE	2.0 (Slow Progress)
10	1.3	NE	1.6	2.0 (LOI)
11	Bedrock Not Encountered			2.5 (LOI)
12	NE	2.7	NE	3.0 (LOI)
13	NE	2.4	NE	2.6 (LOI)
14	1.2	NE	1.4	1.6 (Near Refusal)
15	1.4	1.6	1.9	2.0 (LOI)
16	1.0	1.7	NE	2.0 (LOI)
17	2.1	2.3	NE	3.1 (LOI)
18	Bedrock Not Encountered			2.3 (Near Refusal)
19	1.1	NE	1.6	1.8 (Refusal)
20	NE	1.8	NE	2.2 (LOI)
21	NE	2.2	NE	2.4 (LOI)
22	NE	1.9	NE	2.1 (LOI)
23	NE	NE	1.0	1.6 (Near Refusal)
24	1.3	NE	NE	2.7 (LOI)
25	Bedrock Not Encountered			2.6 (LOI)
26	Bedrock Not Encountered			3.0 (LOI)
27	Bedrock Not Encountered			3.3 (LOI)
28	Bedrock Not Encountered			3.1 (LOI)
29	2.7	NE	NE	3.0 (LOI)

Table 1 – Summary of Bedrock Conditions (cont..)

Pit No.	Depth to Extremely Low to Very Low Strength Rock	Depth to Low Strength Rock	Medium High to Strength Rock	Termination Depth (m)(Reason)
30	Bedrock Not Encountered			3.5 (LOI)
31	2.3	NE	NE	3.5 (LOI)
32	NE	NE	2.5	2.8 (LOI)
33	Bedrock Not Encountered			3.3 (LOI)
34	Bedrock Not Encountered			3.0 (LOI)
35	Bedrock Not Encountered			1.1 (LOI)
36	Bedrock Not Encountered			1.1 (LOI)
37	Bedrock Not Encountered			1.1 (LOI)
38	Bedrock Not Encountered			1.1 (LOI)
39	Bedrock Not Encountered			1.1 (LOI)
40	Bedrock Not Encountered			1.1 (LOI)

Where: NE = Not encountered LOI = Limit of investigation

No free groundwater was observed during excavation of the test pits. However the pits were backfilled immediately following excavation precluding longer term monitoring of groundwater levels. Groundwater conditions rarely remain constant and can change seasonally due to variations in rainfall, temperature and soil permeability. For these reasons, it is noted that the moisture condition of the site soils may vary considerably from the time of the investigation compared to at the time of construction.

6. Laboratory

Nine samples collected from the test pits were tested in the laboratory for measurement of California bearing ratio (CBR) and compaction properties and/or plasticity properties. The detailed laboratory test report sheets are given in Appendix D with the results summarised in Table 2 below.

Table 2 – Summary of Laboratory Testing

Pit No	Depth (m)	LL (%)	PI (%)	FMC (%)	OMC (%)	MDD t/m ³	CBR (%)	Swell (%)	Emerson Class No.	Field Description
3	0.5 – 0.7	NT	NT	23.0	28.0	1.49	3.0	1.5	NT	Sandy Clay
7	1.4	63	37	23.2	NT	NT	NT	NT	4	Silty Clay
9	0.7 – 0.9	NT	NT	22.0	28.0	1.51	5.0	0.0	NT	Silty Clay
12	1.7	57	34	27.3	NT	NT	NT	NT	4	Clay
14	0.5 – 0.7	66	38	25.6	29.5	1.47	8	1.0	4	Silty Clay
17	1.4	72	48	24.2	NT	NT	NT	NT	4	Silty Clay
22	0.4 – 0.6	49	34	19.4	23.0	1.62	5.0	0.5	4	Clay
28	1.5	47	30	23.0	NT	NT	NT	NT	4	Silty Clay
33	1.5	45	30	20.3	NT	NT	NT	NT	4	Silty Clay

Where LL = Liquid limit
 PI = Plasticity Index
 LS = Linear shrinkage
 FMC = Field moisture content

OMC = Optimum moisture content
 MDD = Maximum dry density (standard)
 CBR = California bearing ratio
 NT = Not tested

The samples tested for CBR were compacted to about 100% standard dry density ratio at close to the optimum moisture content and soaked for four days under a surcharge loading of 4.5 kg.

The compaction test results indicate that the soils tested from pit 7 and Pits 13 and 17 were up to 6% dry of their standard optimum moisture contents.

The Atterberg limits test results indicate that the clayey soils tested were of medium to high plasticity and high plasticity (i.e. liquid limit greater than 50%). The clayey soils would be expected to be highly susceptible to shrinkage and swelling movements with changes in soil moisture content.

One sample each from Pits 1 – 34 was also screened for salinity. Figure 4 presents the variations of salinity with depth, based on salinity (ECe) profiles at all test pit locations, together with the salinity classifications of Richards (1954).

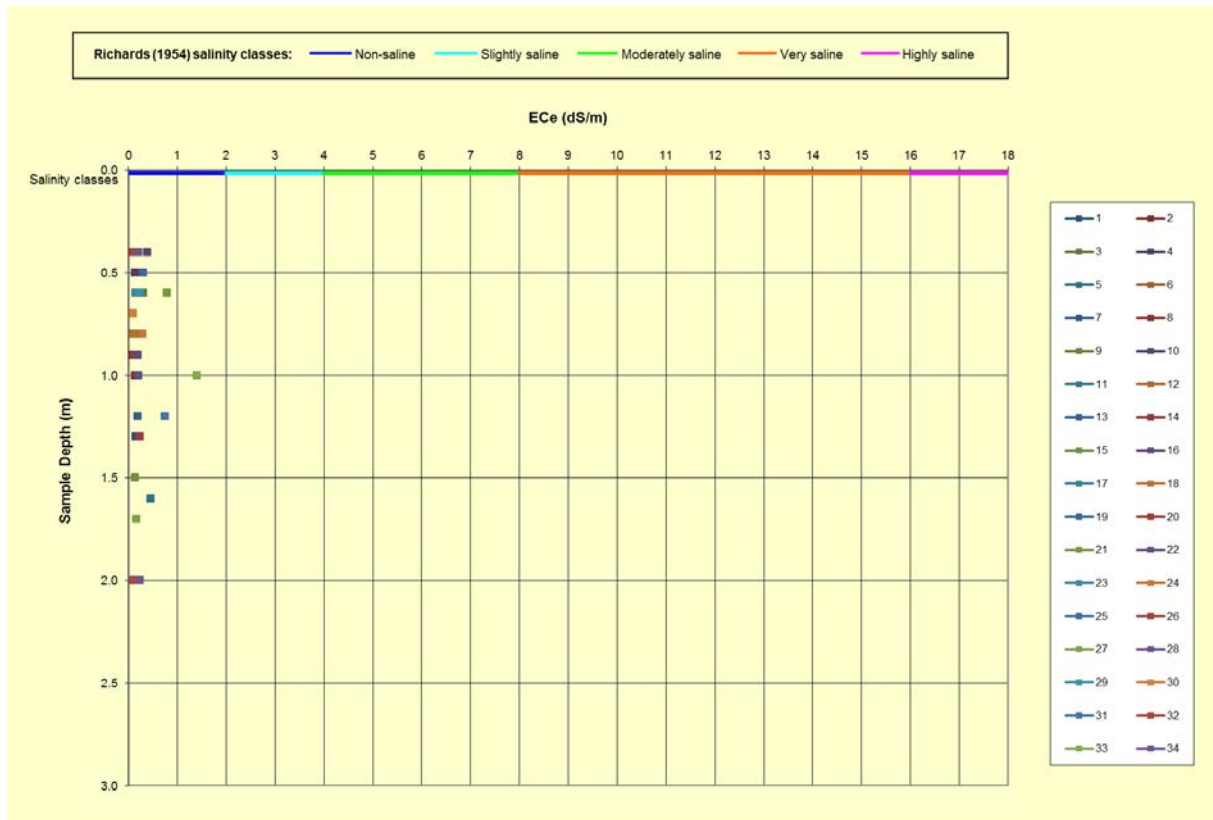


Figure 4: Vertical Salinity Profiles and Classes

The results indicate that all samples tested were non-saline.

7. Comments

7.1 General

The following comments are based on the results of limited subsurface investigation and Douglas Partners (DP) experience with similar projects. No design details of the proposed future development were available at the time of the investigation.

7.2 Site Classification

Site classification in accordance with AS2870 - 2011 provides guidance on the patterns and magnitude of moisture related seasonal ground movements that must be considered in design.

Given the variance in subsurface conditions, the corresponding range of estimated characteristic surface movements (y_s) for the typical subsurface conditions across the site have been calculated using the methods outlined in Section 2 of AS 2870 and presented in Table 3 below.

Table 3: Indicative Site Classifications

Typical Subsurface Conditions	y _s Range (mm)	Site Classification
Very loose to loose sands/silts in excess of 0.4 m	-	Class P (problem site)
Predominantly sand soils (e.g. Pit 27)	<20	Class S (slightly reactive)
Rock encountered and some medium to high plasticity clays (e.g. Pit 5)	20 – 40	Class M (moderately reactive)
Predominantly medium to high plasticity clays (e.g. Pit 18)	40 – 60	Class H1 (highly reactive)

The above indicative classifications are also based on the assumption that no further filling is placed in the building footprints at the site. The need to consider uncracked conditions for the first five years after cohesive filling placement (or decreased cracking depths for two years after excavation), as required by AS 2870, will exacerbate ground surface movements if more than 0.4 m of site sourced or imported clay-bound filling is used in building pads. As a guide, characteristic surface movements could increase by up to about 25 mm, corresponding with 'Class H2' or 'Class E' classifications, where more than 0.4 m of clay filling is placed under controlled conditions. Consideration should therefore be given to the use of low reactivity filling to mitigate against any additional surface movements for filling depths greater than 0.4 m (refer below).

It is noted that the classification is appropriate for the areas investigated in its present condition and is independent of future site preparation measures and construction. It must also be noted that the test pits excavated within the dam embankments would be considered Class P (problem site) due to the presence of undocumented filling, however it is assumed that as this material is generally above ground level, it is assumed that it would be removed should development be proposed within these areas.

It is noted that depending on preceding weather conditions, Class P lots may be warranted due to adverse water conditions/groundwater seepages due to the presence of sand/gravel soils underlying parts of the site. However, the installation of subsoil drains around block perimeters and/or gravel drainage mattresses could resolve the potential P classification.

It is further noted that, given the size of the site and limited investigation, specific geotechnical investigation should be undertaken to refine the above indicative classifications.

7.3 Earthworks and Site Preparation

7.3.1 Stripping

Site preparation for the construction of pavement areas and structures should include the removal of uncontrolled filling, roots, topsoils, vegetation, moisture affected soils and other deleterious materials such as organic matter and/or tree affected soils from the proposed construction areas.

Based on the results of the investigation, the depth of topsoil was up to 0.3 m, however generally 0.1 – 0.2 m. Deeper excavations will be necessary at these locations and any other areas where localised thicker topsoils or unsuitable materials, including undocumented filling, are encountered, if inclement weather precedes construction or if the contractor adopts inappropriate stripping methods, particularly within low lying areas and gully lines. Preceding weather conditions will have a significant influence on stripping depths.

Silty/sandy soils were encountered underlying the topsoil over the majority of the site generally to depths of 0.3 – 0.5 m, however up to 3.3 m depth and allowance should be made for its potential full removal in pavement areas (pending filling depths) or alternatively use of a bridging or replacement layer and at least partial removal in controlled filling areas (up to 0.5 m following topsoil stripping). This material is difficult to handle and compact upon, particularly if subject to water ingress and would require careful moisture control. The final depth of stripping will be heavily dependent on prior weather conditions. It is recommended that prior to any stripping of this material, inspection be undertaken by a suitably qualified geotechnical engineer to assess the extent of removal, or to advise on any other remedial works which may be required (ie: bridging layers and/or geofabric layers).

Undocumented filling was encountered within the dam embankment test pits (Pits 31 – 34 to depths of to depths of 0.6 – 1.1 m) and at the surface in Pit 25. Should development be proposed within the dam areas, the embankment filling and any underlying topsoil and water softened material must be removed.

It is noted that some of the proposed development area contains mature trees and as such root affected soil will be encountered. The depth of root affected soils can only be determined on-site during site works however allowance should be made for at least 1.0 m of stripping of these soils in areas adjacent to trees.

7.3.2 Site Trafficability

Following periods of wet weather, the natural surface across the site will be boggy and effectively untrafficable to all but tracked construction vehicles.

Some measures that can be undertaken to reduce the impact of wet weather on the earthworks construction include:

- retain grass cover wherever possible;
- provide cut surfaces with a slight but even cross-gradient to assist surface drainage;
- “seal” exposed fill surfaces at the end of each work day by running over with a smooth-wheeled roller;
- armour temporary access roads with rockfill; and
- form swale drains at upslope locations to help intercept surface and near-surface seepage water and to redirect it into existing drainage gullies or dams, or to sediment retention ponds.

7.3.3 Excavation Conditions

Removal of the filling, topsoil, natural soils and up to low strength bedrock should be readily achievable using conventional earthmoving plant. Below the slow progress/refusal depths

(encountered in Pits 3, 5, 8, 9, 14, 18, 19 and 23 at 1.6 – 2.6 m depths) large excavators fitted with rock hammers, single tyne ripper and toothed buckets would be required at low production rates. Should excavation depths be deeper than the depths of investigation, additional geotechnical assessment would be required in order to provide comment.

7.3.4 Excavation Support

The natural soils and bedrock exposed in cut would have only limited capacity to stand vertically without support over extended periods of time. Table 3 below provides recommended maximum slopes for temporary and permanent cut batters.

Table 3: Recommended Maximum Batter Slopes in Cut

Strata	Temporary Batters (H:V)	Permanent Batters (H:V)
At least medium dense/stiff natural soil	1.5:1	3:1
Extremely Low to Very Low Strength Rock	1:1	1.5:1
Low Strength Rock	0.5:1	1:1

Where excavation is proposed right up to the property boundary, or where battering of the excavation is not possible, there will be a need for retaining structures to prevent lateral movement of the retained soils in order to reduce the risk of potential damage to neighbouring land, structures, footpaths and/or services. Feasible options would include either soldier piles with close shuttering or sprayed concrete infill panels or contiguous piling.

In areas where cantilevered retaining structures are proposed, it is suggested that earth pressures on retaining walls due to the retained soils be based on a triangular pressure distribution calculated as follows:

$$h_z = \gamma k_a z$$

where,

h_z	=	horizontal pressure at depth z
γ	=	unit weight of retained soil
	=	20 kN/m ³ (soil and extremely weathered rock)
	=	22 kN/m ³ (very low or greater strength rock)
k_a	=	active earth pressure coefficient
	=	0.3 for natural soils
	=	0.3 for weathered bedrock

Drainage behind all retaining walls should be provided or, alternatively, full hydrostatic pressure allowed for in design. In the event that hydrostatic pressures are allowed, densities of the retained soils can be reduced to the buoyant values.

Where applicable, superimposed surcharge loads due to adjacent roadways, inclined surfaces etc should also be accommodated in the design of such structures.

An “at rest” pressure coefficient (k_0) of 0.5 would be appropriate where support must be provided to adjacent boundaries and where movement-intolerant services are present within the adjacent footpaths.

7.3.5 Re-Use of Onsite Material

The topsoil and the underlying silty/sandy layers are not considered to be soil suitable for engineering applications. The silty/sandy soils can be difficult to handle and compact, and are prone to loss of strength upon saturation. Blending of the non-organic silty sand soils with the site clayey soils and weathered rock may produce a suitable material suitable for inclusion in controlled filling. Alternatively, the silty sand soil could be placed in non-structural applications.

The natural soils and undocumented filling underlying the topsoil and silty soils generally comprise clayey and sandy soils with varying amounts of silt and gravel. The site clays are variably medium to high plasticity and high plasticity. The high plasticity clayey soils will be susceptible to shrink/swell movements with a change in moisture conditions. It is considered the reuse of these soils for controlled fill applications should be used with caution. It is advised that if reuse is required and a Class M (moderately reactive) site classification is desired then it should be suitably mixed with a low plasticity granular material, under the advice of a geotechnical engineer or else used below 1.5 m depth of finished surface level. The existing uncontrolled filling must be culled of any unsuitable fractions such as topsoil pockets, organic material etc. prior to reuse, and allowance must be made for the additional cost and time of these activities.

Pending prior weathered conditions, the soils may be required to be moisture conditioned (ie: dried or moistened).

Upon excavation/drilling, the extremely low to very low strength rock will most likely deteriorate to have similar properties as to clayey silt or silty sand soil with reuse in general fill and controlled fill areas provided the material is blended as outlined above. As excavation proceeds into low or greater strength rock, it would be expected that cobble and boulder sized rock pieces would be removed, which would need to be crushed to a general maximum particle size of 75mm prior to use within filling areas. Some rock particles, say up to 150 mm would be considered acceptable however only in a small percentage of the overall filling volume, say 5 – 10%. Design details and further geotechnical investigation would be required to determine if the use of a crushing plant will be required.

Prior to offsite reuse of material excavated from site, a waste classification assessment should be undertaken in accordance with current NSW Environment Protection Unit guidelines.

7.3.6 Filling Selection, Placement and Compaction

In order to achieve Class M site classifications in areas of filling, it will be necessary for any high plasticity clays to be avoided in structural areas or else placed at a depth of 1.5 m below foundation level. Generally low to medium plasticity clays (i.e. $LL < 50\%$) and blended soils comprising a mixture of clay, silt, sand and gravel would be considered appropriate to achieve Class M conditions. The depth of filling will also need to be considered in predicting likely classification; generally the deeper the filling, the greater the likelihood of a H1 classification. All sources of imported filling should be assessed by a geotechnical engineer as to its suitability to conform to a filled Class M or H1 profile.

Prior to filling, the stripped surfaces must be inspected and test rolled in the presence of a geotechnical engineer. Any areas exhibiting significant deflections under test rolling must be appropriately treated at the direction of the geotechnical engineer.

All controlled filling must be placed in horizontal layers of maximum 250 mm loose thickness and compacted to a minimum 98% standard maximum dry density ratio except in the upper 1 m of pavement areas where it should be compacted to 100% standard maximum dry density. The material should have a moisture content within the range of $\pm 2\%$ of standard optimum at the time of placement.

All constructed fill batters should be constructed no steeper than 3:1 (horizontal:vertical), protected against erosion by vegetating the exposed surface and construction of toe and spoon drains as a means of controlling surface water flows on the batters.

To validate the filling quality, field inspections and in-situ testing of future earthworks must be undertaken in order to satisfy the requirements for Level 1 controlled filling AS 3798 – 2007 (Ref 3).

7.3.7 Site Drainage

It is recommended that subsurface and surface drainage be installed early in the works programme and maintained at the site to minimise groundwater and overland flows. All collected stormwater, groundwater and roof runoff should be discharged into the stormwater disposal system.

The extent of subsurface drainage is difficult to determine and best undertaken during construction as it is highly dependent on prior weather conditions.

In order to militate against the effects of groundwater seepages, it is recommended that a series of subsoil drainage lines be installed within the base of gully lines to collect and drain groundwater to the stormwater systems or natural drainage reserves.

There may also be the need for rock drainage layers under roadways or within blocks should groundwater springs be encountered. It is noted that the occurrence of groundwater springs can usually only be assessed or detected during bulk earthworks.

It is noted that the geotechnical investigation was undertaken during a period of relatively dry weather and that significant changes in groundwater conditions, particularly within the sand/gravel layers underlying parts of the site, must be expected if construction is undertaken during or following extended periods of inclement weather.

7.4 Foundations

Following site preparation as outlined in Section 7.3 and subject to earthworks options and building design, foundation options for the future buildings/structures could include pad and strip footings or bored piers supported on either future controlled filling, natural soils or weathered rock. Footings should not be founded in very loose or loose sands. Suggested allowable base bearing pressures are as follows:

• Stiff / medium dense natural soils	100 kPa
• Controlled filling:	150 kPa
• Very stiff to hard/dense natural soils	150 kPa
• Extremely low to very low strength bedrock	500 kPa
• Low strength bedrock	1250 kPa
• Medium to high strength bedrock	2500 kPa

It is recommended that all footings found within a uniform bearing stratum and should be inspected by a suitably qualified engineer prior to placement of reinforcing steel and pouring of concrete to verify design assumptions.

7.5 Pavement Design Considerations

The CBR results are given in Table 2 and the test report sheets are provided in Appendix D.

Based on the results of the field investigation, laboratory testing and previous experience in the area, it is suggested that a design CBR value of 3% for clayey soils be adopted for preliminary design of pavements. Subgrade conditions should be reviewed during construction. The review should be carried out by a suitably qualified engineer and would involve additional CBR testing to confirm the design assumptions regarding subgrade strength.

The standard of construction, the selection of materials and quality of workmanship for the pavements should satisfy the requirements of the latest edition of the local council specifications for pavements. Surface and subsoil drainage must be installed and maintained to protect the pavement and subgrade. Subsoil drains should be located at a minimum of 0.5 m depth below subgrade level.

8. Further Investigation

Further investigation of the site will be required following conceptual design to provide more detailed and specific advice on excavation conditions, support requirements, foundations options and pavement design parameters.

9. Summary

The site investigation undertaken as described above has indicated that the site is suitable from a geotechnical perspective for rezoning of the land for residential development. Comments have been given on the various geotechnical aspects of the proposed development.

Conceptual comments on design and construction aspects are also given in the report. Further testing and assessment will be required as the design of the subdivision proceeds and as such, this report must be considered as being preliminary in nature.

10. References

1. Geology of Canberra 1:100 000 Geological Series Sheet 8727, Bureau of Mineral Resources, (1992).
2. Australian Standard AS 2870 – 2011 *Residential Slabs and Footings*.
3. Australian Standard AS 3798 – 2007 *Guidelines on Earthworks for Commercial and Residential Developments*.

11. Limitations

Douglas Partners (DP) has prepared this report for this project at Lot 1 DP 798111, North Bungendore in accordance with DP's proposal dated 21 April 2016 and acceptance received from Mr John Wright of Queanbeyan - Palerang Regional Council dated 21 April 2016. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Queanbeyan - Palerang Regional Council for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition

materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About this Report

About this Report

Douglas Partners



Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Drawing 1 – Test Location Plan



Locality Plan

LEGEND

- Approximate Site Boundary
- Proposed Test Pit Location (Geotech only)
- Proposed Test Pit Location (Geotech and Contamination)
- Proposed Test Pit Location (Contamination only)
- Creek lines

Potential Sources of Contamination

- Disturbed ground noted in the 1985 Aerial Photograph and slightly visible in the 1992 Aerial Photograph
- Dirt track noted in the 1992 Aerial Photograph
- Disturbed ground noted in the 1992 Aerial Photograph
- Buildings noted in the 1992 Aerial Photograph
- Building noted in the 1992 and 2002 Aerial Photographs
- Entrance driveways to the buildings noted in the 1992 and 2002 Aerial Photographs
- Toilet with hole beneath as septic tank
- Disturbed ground
- Embankment
- Dam with scattered rubbish from landfill
- Dams



NOTE: Base drawing from Queanbeyan-Palerang Council



Appendix C

Explanatory Notes
Results of Field Work (Pits 1 – 40)



Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low

reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:
4,6,7
N=13
- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:
15, 30/40 mm

Sampling Methods

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.



Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 - 5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.



Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners



Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U ₅₀	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General



Asphalt



Road base



Concrete



Filling

Soils



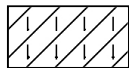
Topsoil



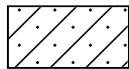
Peat



Clay



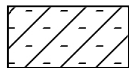
Silty clay



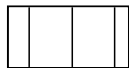
Sandy clay



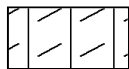
Gravelly clay



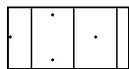
Shaly clay



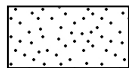
Silt



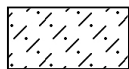
Clayey silt



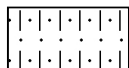
Sandy silt



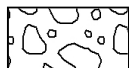
Sand



Clayey sand



Silty sand



Gravel



Sandy gravel



Cobbles, boulders



Talus

Sedimentary Rocks



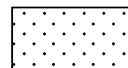
Boulder conglomerate



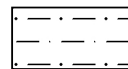
Conglomerate



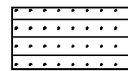
Conglomeratic sandstone



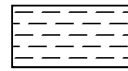
Sandstone



Siltstone



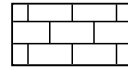
Laminite



Mudstone, claystone, shale

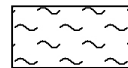


Coal

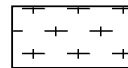


Limestone

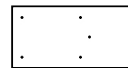
Metamorphic Rocks



Slate, phyllite, schist

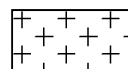


Gneiss

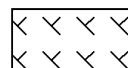


Quartzite

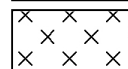
Igneous Rocks



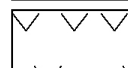
Granite



Dolerite, basalt, andesite



Dacite, epidote



Tuff, breccia



Porphyry

Appendix D

Results of Laboratory Tests (17 sheets)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722430
NORTHING: 6097628

PIT No: 1
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.15	TOPSOIL-moist, dark brown silty sand with rootlets		D	0.05				
		SILTY SAND- very loose to loose moist, light grey, fine grained silty sand		D	0.2				
	0.4	SILTY GRAVELLY SAND-very loose to loose, moist, light brown, fine to coarse grained silty gravelly sand, rounded gravel up to 60mm		D	0.5				
	0.6	CLAYEY SILTY SAND-medium dense then dense, moist, orange and brown, fine to medium grained clayey silty sand, some gravel							
	1			D	1.3				
	1.7	SANDSTONE-extremely low strength, extremely weathered, orange and brown, fine to medium grained sandstone							
	2	-from 2.1m, very low strength, highly weathered							
	2.5	Pit discontinued at 2.5m -limit of investigation		D	2.4				
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U _t Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W _s Water seep	S Standard penetration test	
E Environmental sample	W _l Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722555
NORTHING: 6097676

PIT No: 2
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
		TOPSOIL-moist, brown silty sand with rootlets							
	0.2	SILTY SAND-very loose to loose, moist, light grey, fine to medium grained silty sand							
	0.3	GRAVELLY SILTY SAND-loose, moist, orange brown gravely silty sand, fine to medium grained sand, fine rounded gravel up to 6mm in size -from 0.6m, medium dense		D	0.8				
	1								
	1.1	SILTY SAND-medium dense to dense, moist, orange brown, fine to medium grained silty sand, slight fine grained gravel							
	2								
	2.1	SANDSTONE-extremely low strength, extremely weathered, light grey and yellow brown sandstone -from 2.3m, very low strength, highly weathered		D	2.3				
	2.5	Pit discontinued at 2.5m -limit of investigation							
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722883
NORTHING: 6097618

PIT No: 3
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.15	TOPSOIL-moist, grey brown silt with rootlets		D	0.05				
		SILTY SAND-medium dense, moist, grey brown, fine to medium grained silty sand, some gravelly seams		D	0.2				
	0.4	SANDY CLAY-very stiff, hard, dry to moist, high plasticity sandy clay		D	0.5				
				B	0.6				
				D	0.7				
1	1.0	SHALE-low to medium strength, highly to moderately weathered, brown and yellow brown shale						1	
		-from 1.4m, high strength, moderately weathered, purple-grey		D	1.5				
	1.6	Pit discontinued at 1.6m -refusal							
2								2	
3								3	
4								4	
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U _s Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W _s Water seep	S Standard penetration test	
E Environmental sample	W _L Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722883
NORTHING: 6097534

PIT No: 4
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.2	TOPSOIL-moist, grey brown sandy silt with rootlets							
	0.4	CLAYEY SILT-firm to stiff, stiff, wet to moist, light yellow brown, low plasticity clayey silt							
	0.5	SILTY CLAY-very stiff, moist to dry, yellow brown and red brown, medium plasticity silty clay		D	0.5				
	0.6	-from 0.6m, hard, dry to moist							
	1.5	SHALE-extremely low strength, extremely weathered, light yellow brown and grey shale		D	1.8				
	1.9	-from 1.9m, low strength, highly weathered, highly fractured							
	2.2	-from 2.2m, medium strength, moderately weathered							
	2.3	Pit discontinued at 2.3m -limit of investigation							
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U ₂ Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W ₂ Water seep	S Standard penetration test	
E Environmental sample	W ₃ Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723094
NORTHING: 6097650

PIT No: 5
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.1	TOPSOIL-moist to dry, brown gravelly silt/silty gravel with rootlets		D	0.4				5 10 15 20
		SILTY SANDY GRAVEL-dense, moist to dry, brown silty sandy gravel with rootlets							
	0.6	SILTY CLAY-hard, dry to moist, red brown, medium plasticity silty clay, slight sand		D	0.9				
	1.3	SANDSTONE-extremely low strength, extremely weathered, light yellow brown sandstone							
		-from 1.8m, very low to low strength, highly weathered							
		-from 2.3m, low to medium strength, highly to moderately weathered							
	2.6	Pit discontinued at 2.6m -slow progress							
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

- ☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _t	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _{seep}	Water seep
E	Environmental sample	W _{level}	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723023
NORTHING: 6097394

PIT No: 6
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
		TOPSOIL-dry to moist, grey brown sandy silt with rootlets							
	0.3	SILT-hard, moist to dry, grey brown and orange, low plasticity silt							
	0.5	SILTY GRAVEL-very dense, dry to moist, grey brown silty gravel, fine to coarse grained sub-angular quartz gravel up to 50mm in size							
	0.7	SILTY GRAVELLY CLAY-hard, dry to moist, yellow brown and grey, medium to high plasticity silty gravelly clay, quartz gravel							
	1								
	1.2			D	1.2		pp = 320		
	1.7								
	2	SILTY CLAY-very stiff, moist to dry, yellow brown, medium to high plasticity silty clay, some fine grained sand		D	2.0		pp = 300		
	2.6	Pit discontinued at 2.6m -limit of investigation							
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723189
NORTHING: 6097449

PIT No: 7
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	TOPSOIL-moist to dry, grey brown silty with rootlets		D	0.05							
	0.3	SILT-stiff, moist to dry, light grey orange and brown, low plasticity silt		D	0.2							
	0.7	CLAYEY SILT-very stiff, dry to moist, red brown, low plasticity clayey silt, some fine grained sand		D	0.5							
		- hard from 0.6m		D	0.6							
	1.8	SILTY CLAY-hard, moist to dry, red brown and light grey, medium to high plasticity silty clay		D	1.0							
				D	1.4							
	2.4	GRAVEL-dense, dry to moist, light grey quartz gravel, fine to coarse grained with cobbles up to 100mm in size, quartz sub-angular and angular		D	2.2							
	2.6	SANDY SHALE-very low strength, highly weathered, orange brown and light grey sandy shale										
	2.6	Pit discontinued at 2.6m -limit of investigation										
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723297
NORTHING: 6097554

PIT No: 8
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.2	TOPSOIL-moist, brown and red brown sandy silt with rootlets CLAYEY SILT-firm, wet to moist, red brown, low plasticity clayey silt -from 0.45m, stiff, moist to wet -from 0.8m, stiff to very stiff		D	1.0				
	1.8	CLAYEY SILTY GRAVEL-dense, moist to dry, light yellow brown clayey silty gravel up to 100mm in size		D	2.0				
	2.3	SANDSTONE-low to medium strength, highly to moderately weathered, orange brown and grey sandstone							
	2.6	Pit discontinued at 2.6m -slow progress							
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

- ☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _{seep}	Water seep
E	Environmental sample	W _{level}	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723456
NORTHING: 6097564

PIT No: 9
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.1	TOPSOIL-moist, light grey brown silt with rootlets							
		GRAVELLY SILT-firm to stiff/loose, moist to dry, light grey gravelly silt, some silty gravel seams							
	0.4	SILTY CLAY-very stiff to hard, dry to moist, red brown, medium plasticity silty clay, slight gravel (alluvium)							
				B	0.7				
				D	0.8				
					0.9				
	1.2	SILTY CLAY-hard, dry to moist, light grey and yellow brown, medium plasticity silty clay, slight sand (residual)							
				D	1.5				
	1.6	SANDY SHALE-low strength, highly weathered, yellow brown and light grey sandy shale, highly fractured							
	2.0	Pit discontinued at 2.0m -slow progress							
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Bulk sample	U _s Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W _{seep} Water seep	S Standard penetration test	
E Environmental sample	W _{level} Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723619
NORTHING: 6097513

PIT No: 10
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.1	TOPSOIL-moist to dry, light grey and brown sandy silt with rootlets		D	0.05							
		SILTY GRAVELLY SAND- dense, moist to dry, light grey and brown silty gravelly sand, fine grained		D	0.2							
	0.4	SILTY CLAY-hard, dry to moist, red brown and yellow brown, medium plasticity silty clay, slight fine grained sand		D	0.4							
				D	0.5							
					0.8		pp=>400					
1	1.3	SANDY SHALE-extremely low strength, extremely weathered, light grey and yellow brown sandy shale										
		-from 1.6m, medium strength, moderately weathered		D	1.6							
2	2.0	Pit discontinued at 2.0m -limit of investigation										
3												
4												
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U _s	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723506
NORTHING: 6097395

PIT No: 11
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.1	TOPSOIL-moist to dry, grey and brown silt with rootlets							
	0.3	SANDY SILT-stiff, moist to dry, light grey and brown, low plasticity sandy silt							
	0.8	CLAYEY SILT-very stiff, dry to moist, light yellow brown and red brown, low plasticity clayey silt, some ironstone gravel, occasional quartz gravel							
	1.1	-from 0.6m, hard							
	1.6	SILTY CLAY-hard, dry to moist, red brown and light grey, medium plasticity silty clay		D	0.8				
	1.8								
	2.0	SILTY CLAY-very stiff, moist to dry, pink red brown and light grey, medium plasticity silty clay, occasional angular quartz gravel		D	1.6		pp=>400		
	2.5								
	2.5	Pit discontinued at 2.5m -limit of investigation			2.0		pp = 240		
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723538
NORTHING: 6097289

PIT No: 12
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.15	TOPSOIL-moist to dry, light grey and brown silt with rootlets		D	0.05				
	0.3	SILT-soft to firm, wet, light grey, low plasticity silt		D	0.2				
	0.9	SILTY CLAY-stiff, moist to dry, light yellow brown, medium plasticity silty clay, some sub-rounded gravel		D	0.4				
		-very stiff, from 0.5m		D	0.5				
		-hard, dry to moist from 0.6m							
	1.4	CLAYEY SILT-very stiff, moist to dry, light yellow brown and orange brown, low plasticity clayey silt		D	1.0				
					1.2		pp = 260		
	2.1	CLAY-stiff, moist, yellow and light grey, high plasticity clay			1.7		pp = 180		
	2.7	SILTY CLAY-very stiff, moist to dry, light grey and pink red brown, medium plasticity silty clay			2.3		pp = 230		
		-from 2.3m, rounded gravelly quartz							
	3.0	SANDY SHALE-low to medium strength, highly to moderately weathered, orange brown and light grey sandy shale							
	3.0	Pit discontinued at 3.0m -limit of investigation							
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U _s Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W _s Water seep	S Standard penetration test	
E Environmental sample	W _l Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723425
NORTHING: 6097145

PIT No: 13
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	TOPSOIL-moist to dry, grey brown silt with rootlets		D	0.05							
	0.3	SILT-firm to stiff, moist, light grey and brown, low plasticity silt, fine grained sand		D	0.2							
	0.6	SILT-stiff, moist, light yellow brown, low plasticity silt -very stiff, from 0.4m		D	0.5							
	0.8	GRAVELLY SILT-very stiff, dry to moist, light grey gravelly silt, fine to medium grained ironstone gravel										
	1.1	SANDY SILT-very stiff, dry to moist, light yellow brown, low plasticity sandy silt		D	1.0							
	1.4	SILTY CLAY-very stiff, moist to dry, light grey and orange brown, medium plasticity silty clay		D	1.2							
	2.2	CLAY-stiff, moist, yellow brown and light grey, high plasticity clay		D	1.5		pp = 180					
	2.4	GRAVELLY SILTY CLAY-very stiff, moist to dry, orange brown and grey, medium plasticity gravelly silty clay (residual)										
	2.6	SANDY SHALE-low to medium strength, highly to moderately weathered, orange brown and grey brown sandy shale										
		Pit discontinued at 2.6m -limit of investigation										
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W Water seep	S Standard penetration test	
E Environmental sample	W Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723615
NORTHING: 6097104

PIT No: 14
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.15	TOPSOIL-dry to moist, brown and grey silt with rootlets							
	0.3	SANDY SILT-very stiff, moist to dry, light grey, low plasticity sandy silt							
		SILTY CLAY-hard, dry to moist, red brown, high plasticity silty clay		B	0.5				
					0.7				
				D	0.9		pp = 400		
	1.2	SHALE-extremely low strength, extremely weathered, orange brown and grey brown shale							
	1.6	-from 1.4m, medium strength, moderately weathered							
	1.6	Pit discontinued at 1.6m -near refusal							
	2								
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723733
NORTHING: 6097356

PIT No: 15
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.2	TOPSOIL-moist, brown silt with rootlets										
	0.7	SANDY SILTY GRAVEL-loose, moist to dry, brown and orange brown sandy silty gravel, fine grained sub-angular (colluvium)		D	0.6							
	0.7	-very dense, from 0.6m										
	1.4	SILTY CLAY-hard, dry to moist, red brown and grey, medium plasticity silty clay										
	1.4	SHALE-extremely low strength, extremely weathered, light grey and yellow brown shale		D	1.5							
		-from 1.6m, low strength, highly weathered, highly fractured										
		-from 1.9m, medium strength, moderately weathered										
	2.0	Pit discontinued at 2.0m -limit of investigation										
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723925
NORTHING: 6097412

PIT No: 16
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
		TOPSOIL-moist to dry, light brown silt with rootlets							
	0.25	SILT-stiff to very stiff, dry to moist, light red brown, low plasticity silt, slight clay							
1	1.0	SHALE-low strength, highly weathered, light grey shale, highly fractured		D	0.9				
		-from 1.3m, extremely low strength, extremely weathered, orange brown							
		-from 1.7m, low to medium strength, high to moderately weathered seams		D	1.6				
2	2.0	Pit discontinued at 2.0m -limit of investigation							
3									
4									
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723969
NORTHING: 6097266

PIT No: 17
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
		TOPSOIL-moist, light brown silt with rootlets		D	0.05				
	0.25	SANDY SILT-stiff, moist to dry, light orange brown sandy silt		D	0.2				
				D	0.5				
				D	0.6				
	0.9	SILTY CLAY-very stiff, yellow brown and orange brown, high plasticity silty clay							
	1			D	1.4		pp = 280		
	2	-from 1.9m, gravelly (sub-rounded quartz gravel)							
	2.1	SANDSTONE-very low strength, highly weathered, orange brown sandstone, fine to medium grained							
	2.4	-from 2.3m, low strength, highly weathered							
		Pit discontinued at 2.4m -limit of investigation							
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723923
NORTHING: 6097035

PIT No: 18
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.15	TOPSOIL-moist, grey brown silt with rootlets		D	0.05				
		SILT-firm, wet, light grey, low plasticity silt		D	0.2				
	0.4	SILTY CLAY-very stiff, moist to dry, yellow and brown, high plasticity silty clay		D	0.5				
				D	0.8				
				D	1.0				
	1.2	SILTY CLAY-very stiff, moist to dry, light grey and yellow brown, medium plasticity silty clay, some sand							
				D	2.0		pp = 300		
	2.5	SILTY CLAY-very stiff, moist to dry, light grey and orange brown, medium plasticity silty clay, some sandy seams							
					2.7		pp = 310		
	3.1	Pit discontinued at 3.1m -limit of investigation							
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U _s Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W _s Water seep	S Standard penetration test	
E Environmental sample	W _l Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 724046
NORTHING: 6097148

PIT No: 19
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
		TOPSOIL-moist, grey brown silt with rootlets							
	0.3	GRAVELLY SILT-stiff, moist, light orange brown, low plasticity gravelly silt, some sand and sub-rounded quartz gravel up to 50mm in size, some quartz cobbles		D	0.5				
	1.1	SANDY SHALE-extremely low strength, extremely weathered, orange brown and red brown sandy shale		D	1.3				
	1.8	-from 1.6m, high strength, moderately to slightly weathered, grey brown and some orange brown							
	1.8	Pit discontinued at 1.8m -refusal							
	2								
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U _s Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W _s Water seep	S Standard penetration test	
E Environmental sample	W _L Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 724148
NORTHING: 6097282

PIT No: 20
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
		TOPSOIL-moist to dry, grey brown sandy silt with rootlets							
	0.3	SANDY SILT-hard, dry to moist, light red brown, low plasticity sandy silt, fine grained sand							
	0.7	SILTY GRAVEL-medium dense, dry to moist, light grey silty gravel, fine grained, ironstone gravel							
	0.9	SILTY CLAY-very stiff, moist to dry, yellow brown, high plasticity silty clay							
	1								
	1.8	SHALE-medium strength, moderately weathered, grey brown and orange brown shale, highly fractured							
	2								
	2.2	Pit discontinued at 2.2m -limit of investigation							
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U _s Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W _s Water seep	S Standard penetration test	
E Environmental sample	W _L Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 724108
NORTHING: 6097436

PIT No: 21
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	TOPSOIL-dry to moist, grey brown silt with rootlets		D	0.05							
		SANDY SILT-stiff, moist to dry, light grey sandy silt, fine grained sand		D	0.2							
	0.4	GRAVELLY SILT-very stiff to hard, dry to moist, orange brown gravelly silt, ironstone gravel		D	0.5							
		-from 0.6m, hard		D	0.6							
		-from 0.7m, light yellow and brown										
1	1.0	SILTY CLAY- stiff, moist, yellow and light grey, high plasticity silty clay		D	1.5		pp = 140-180					
2	2.2	SHALE-low strength, highly weathered, yellow orange and brown shale, highly fractured										
	2.4	Pit discontinued at 2.4m -limit of investigation										
3												
4												
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U _s	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W _s	Water seep	S	Standard penetration test
E	Environmental sample	W _L	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 724281
NORTHING: 6097325

PIT No: 22
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.2	TOPSOIL-dry to moist, grey brown sandy silt with rootlets							
	0.3	SANDY SILT-firm to stiff, moist to dry, light grey and brown sandy silt							
		CLAY-firm to stiff, moist to wet, yellow brown, high plasticity clay, some silt (alluvial)		B	0.4				
					0.6				
1		-from 1.2m, very stiff		D	1.0			1	
	1.6	SILTY CLAY-very stiff, moist to dry, light orange brown, low to medium plasticity silty clay (residual)		D	1.7		pp = 370		
2	1.9	SANDY SHALE-low to medium strength, highly to moderately weathered, light grey and orange brown sandy shale, highly fractured						2	
	2.1	Pit discontinued at 2.1m -limit of investigation							
3								3	
4								4	
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 724523
NORTHING: 6097375

PIT No: 23
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
		TOPSOIL-moist to dry, grey and brown silt with rootlets		D	0.05				
	0.25			D	0.2				
	0.35	SILT-firm to stiff, moist to wet, red brown, low plasticity silt, some sand							
		GRAVELLY SILTY CLAY-hard, dry to moist, red brown, medium plasticity gravelly silty clay, quartz gravel, slight sand (alluvial)		D	0.5				
				D	0.6				
1	1.0	SANDSTONE-medium strength, moderately weathered, light yellow brown and grey sandstone, highly fractured							
				D	1.3				
	1.6	Pit discontinued at 1.6m -near refusal							
2									
3									
4									
N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.									

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

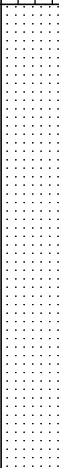
SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U _s	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W _s	Water seep	S	Standard penetration test
E	Environmental sample	W _L	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722393
NORTHING: 6097512

PIT No: 24
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.15	TOPSOIL-moist to dry, light grey silty sand with rootlets							
		SILTY SAND-loose, moist, light yellow brown silty sand, fine grained			0.4				
				B	0.6				
	0.7	SILTY SAND-medium dense, moist, orange brown and grey silty sand			0.8				
		-from 0.9m, very dense, cemented		D					
	1.3	SANDSTONE-extremely low to very low strength, extremely to highly weathered, light yellow brown and grey sandstone			1.5				
		-from 2.3m, extremely low strength, extremely weathered		D	2.6				
	2.7	Pit discontinued at 2.7m -limit of investigation							
	3								
	4								
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U ₂ Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W Water seep	S Standard penetration test	
E Environmental sample	W Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722573
NORTHING: 6097487

PIT No: 25
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.1	FILLING-dry to moist, light grey silty sand		D	0.05				
		SILTY GRAVELLY SAND-moist, brown silty gravelly sand, fine to coarse grained		D	0.2				
	0.3	SILTY SAND-dense then medium dense, moist, red brown and brown silty sand, fine to medium grained		D	0.5				
				D	1.0				
	1.2	SILTY SANDY GRAVEL-dense, moist, yellow brown silty sandy gravel, fine to medium grained, rounded gravel							
	2.1	SILTY SAND-medium dense, moist, light grey and yellow brown silty sand, fine grained							
	2.6	Pit discontinued at 2.6m -limit of investigation							
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface filling

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722660
NORTHING: 6097470

PIT No: 26
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.1	TOPSOIL-moist, grey brown silty sand with rootlets		D	0.05				5
		GRAVEL-very dense, moist, light yellow brown gravel, fine to coarse grained, rounded, some silt and sand		D	0.2				10
				D	0.4				15
				D	0.5				20
				D	1.0				
1	1.1	SILTY CLAY-firm to stiff, wet, light grey and orange brown, low to medium plasticity silty clay, some soft, wet seams		D	2.0				
2									
3	3.0	Pit discontinued at 3.0m -limit of investigation							
4		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722642
NORTHING: 6097553

PIT No: 27
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL-moist to wet, grey brown silty sand with rootlets		D	0.05							
	0.25	SILTY GRAVELLY SAND-medium dense, moist, red brown silty gravelly sand, fine to coarse grained, round gravel		D	0.2							
	0.4	SILTY SAND-dense then medium dense, moist, orange brown silty sand, fine grained, some rounded gravel		D	0.5							
	1			D	1.0							
	1.5	SILTY SAND-medium dense, moist, light grey and orange brown silty sand		D	1.7							
	2											
	3	-from 2.7m, dense, yellow brown										
	3.3	Pit discontinued at 3.3m -limit of investigation										
	4	N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722706
NORTHING: 6097519

PIT No: 28
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.15	TOPSOIL-moist, brown silty sand with rootlets		D	0.05				
		SILTY SAND-moist, light yellow brown silty sand, fine to medium grained		D	0.2				
				D	0.4				
	0.5	SANDY GRAVEL-very dense, moist, light yellow brown sandy gravel, fine to medium grained		D	0.5				
				B	0.7				
	1.1	SILTY CLAY-stiff, moist, yellow brown and light grey, low to medium plasticity silty clay		D	1.2				
				D	1.5				
	1.9	SAND-medium dense, moist, light orange and brown sand, fine to medium grained, some silt							
	2.9	SILT-stiff, moist, light grey, low plasticity silt, slight sand and clayey seams							
	3.1	Pit discontinued at 3.1m -limit of investigation							
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.							

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U _s Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W _{seep} Water seep	S Standard penetration test	
E Environmental sample	W _{level} Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722503
NORTHING: 6097772

PIT No: 29
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	TOPSOIL-moist, brown silty sand with rootlets		D	0.05							
		SILTY SAND-very loose to loose, moist, light grey brown silty sand, fine to medium grained		D	0.2							
	0.4	SILTY GRAVELLY SAND-loose to medium dense, moist to wet, orange brown silty gravelly sand, fine to coarse grained, rounded gravel up to 60mm in size		D	0.5							
		-from 0.6m, medium dense		D	0.6							
1	1.0	SILTY GRAVELLY SAND-medium dense, moist, light yellow brown silty gravelly sand, fine gravel up to 10mm in size		D	1.3							
		-from 1.4m, medium dense to dense, orange brown										
2												
	2.7	SANDY SILTSTONE-extremely low strength, extremely weathered, light grey and some orange brown sandy siltstone, fine grained										
3	3.0	Pit discontinued at 3.0m -limit of investigation										
4		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722739
NORTHING: 6097745

PIT No: 30
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
		TOPSOIL-moist, brown silty sand with rootlets		D	0.02				
	0.15	SILTY SAND-medium dense, moist, grey brown silty sand, fine to medium grained		D	0.05				
	0.3	SILTY GRAVELLY SAND-medium dense, moist, red brown silty gravelly sand, fine to coarse grained, rounded gravel up to 6mm in size		D	0.5				
	0.6	SILTY SANDY GRAVEL-medium dense, moist to wet, red brown silty sandy gravel, fine to medium grained, rounded		D	0.7				
	-from 0.8m, dense								
1	1.1	SILTY SANDY GRAVEL-very dense, moist, light yellow brown silty sandy gravel, fine grained, rounded		D	1.5				
	1.8	SILTY CLAY-very stiff, moist, light grey and yellow brown, medium plasticity silty clay		D	1.9				
2									
	2.6	CLAY-stiff, moist, light grey and yellow brown, high plasticity clay							
3									
	3.5	SILTY GRAVELLY SAND-dense, moist to wet, light yellow brown and grey silty gravelly sand, fine to coarse grained							
	3.7	Pit discontinued at 3.7m -limit of investigation							
4									
N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.									

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _p	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722838
NORTHING: 6097696

PIT No: 31
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL FILLING-moist, light grey silty sand with rootlets		D	0.05							
	0.25	FILLING-stiff, moist, grey brown silty sandy clay		D	0.2							
	0.4	FILLING-generally comprising very stiff, brown sandy gravelly clay with some silt		D	0.5							
1	1.0	SILTY GRAVELLY SAND-dense, dry to moist, light grey silty gravelly sand, lightly cemented -rootlets to 1.1m		D	1.0			1				
				D	1.2							
	1.4	SANDY GRAVELLY CLAY-very stiff, moist to dry, grey brown, high plasticity sand gravelly clay		D	1.5							
				D	1.8							
2								2				
	2.3	SILTSTONE-extremely low strength, extremely weathered, light yellow brown siltstone, some low to medium strength highly to moderately weathered seams										
3								3				
	3.5	Pit discontinued at 3.5m -limit of investigation										
4								4				
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Pit excavated ~1.0m up a dam embankment, measurements taken from top of pit

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722862
NORTHING: 6097420

PIT No: 32
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL FILLING-moist, grey brown sandy silt with rootlets		D	0.05							
	0.6	FILLING-generally comprising moist to dry, grey brown silty sandy gravel filling, siltstone gravel		D	0.5							
1	1.1	SANDY SILT-moist, light grey brown sandy silt, trace rootlets (remnant topsoil)		D	1.0							
	1.3	SANDY SILT-stiff, moist, light grey and orange brown sandy silt, fine grained sand		D	1.5							
2	1.8	GRAVELLY SILTY CLAY-very stiff, moist to dry, orange brown, medium plasticity gravelly silty clay, siltstone gravel		D	2.0							
	2.5	SILTSTONE-medium strength, moderately weathered, light grey and orange brown siltstone										
3	2.8	Pit discontinued at 2.8m -limit of investigation										
4		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Pit excavated ~1.5m up a dam embankment, measurements taken from top of pit

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722336
NORTHING: 6097426

PIT No: 33
PROJECT No: 88336.01
DATE: 31/5/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL FILLING-moist, light grey sandy silt with rootlets										
	0.3	FILLING-generally comprising moist to dry, light orange brown silty sandy gravel										
	0.6	SILTY CLAY-stiff, moist, light yellow brown and grey, medium plasticity silty clay, some fine grained quartz gravel										
	1			D	1.0							
				D	1.5							
	2	CLAYEY SILT-firm, wet, light grey and orange brown, low plasticity clayey silt, some ironstone gravel		D	2.3		pp = 70					
	2.7	GRAVELLY SILTY CLAY-very stiff, moist to dry, orange brown and light grey, medium plasticity gravelly silty clay										
	3											
	4											
	4.1	Pit discontinued at 4.1m										
		N/A Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Pit excavated ~1.5m up a dam embankment, measurements taken from top of pit

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U ₁ Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	W ₁ Water seep	S Standard penetration test	
E Environmental sample	W ₂ Water level	V Shear vane (kPa)	

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 723772
NORTHING: 6097134

PIT No: 34
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.1	TOPSOIL FILLING-generally comprising moist to dry, light grey sandy gravelly silt with rootlets		D	0.05				
		FILLING-generally comprising moist, brown, medium plasticity silty gravelly clay		D	0.2				
				D	0.5				
	0.6	SANDY SILT-hard, dry to moist, light grey sandy silt, trace rootlets (remnant topsoil)							
	0.8	SILTY GRAVELLY CLAY-hard, dry to moist, yellow brown, medium plasticity silty gravelly clay, ironstone gravel							
1	1.0	SILT-very stiff, moist to dry, light grey, low plasticity silt		D	1.0		PP=>400	1	
					1.2				
	1.4	SILTY CLAY-very stiff, moist to dry, light yellow orange brown, medium plasticity silty clay, some fine grained sand and rounded fine grained gravel							
2				D	2.0			2	
	2.2	SILTY GRAVELLY CLAY-stiff, moist, grey brown and orange grey, medium plasticity silty gravelly clay, ironstone gravel			2.3		pp = 120		
3	3.0	Pit discontinued at 3.0m -limit of investigation						3	
4		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.						4	

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Pit excavated ~0.8m up a dam embankment, measurements taken from top of pit

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722468
NORTHING: 6097516

PIT No: 35
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	TOPSOIL-moist, brown silty sand with rootlets		D	0.05							
	0.3	SILTY SAND-loose, moist, red brown silty sand, fine grained		D	0.2							
	0.45	SILTY SANDY GRAVEL-dense, moist, light grey and red brown silty sandy gravel, fine to medium grained, rounded gravel		D	0.5							
	1.0	SILTY SAND-dense, dry to moist, light grey and orange brown silty sand, fine to medium grained		D	1.0							
	1.1	Pit discontinued at 1.1m -limit of investigation										
	2											
	3											
	4											
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

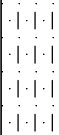
SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722433
NORTHING: 6097493

PIT No: 36
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	TOPSOIL-moist, light grey brown silty sand with rootlets		D	0.05							
		SILTY SAND-loose, light grey brown silty sand, fine to medium grained		D	0.2							
				D	0.5							
	0.6	SILTY SANDY GRAVEL-dense, moist, red brown silty sandy gravel, rounded quartz gravel										
	1.1	Pit discontinued at 1.1m -limit of investigation		D	1.0							
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U _s	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722494
NORTHING: 6097549

PIT No: 37
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
1	0.15	TOPSOIL-moist, brown silty sand with rootlets		D	0.05				1				
		SILTY SAND-medium dense, moist, light grey brown silty sand		D	0.2								
	0.4	SILTY SANDY GRAVEL-dense, moist to dry, red brown silty sandy gravel, fine to coarse grained, rounded quartz gravel, some silty sand seams		D	0.5								
	0.8	SILTY GRAVELLY SAND-dense, dry to moist, light yellow brown silty gravelly sand, fine grained, coarse, rounded quartz gravel up to 50mm in size		D	1.0								
	1.1	Pit discontinued at 1.1m -limit of investigation											
	2								2				
	3								3				
	4								4				
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.											

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

- ☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _t	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _{seep}	Water seep
E	Environmental sample	W _{level}	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722485
NORTHING: 6097492

PIT No: 38
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	TOPSOIL-moist, grey brown silty sand with roots and rootlets		D	0.05							
		GRAVELLY SILTY SAND-medium dense, moist, red brown gravelly silty sand, fine grained, rounded gravel		D	0.2							
	0.45	SILTY GRAVELLY SAND/SANDY GRAVEL-dense, dry to moist, light yellow brown silty gravelly sand/sandy gravel, fine to coarse grained, rounded gravel		D	0.5							
	1			D	1.0							
	1.1	Pit discontinued at 1.1m -limit of investigation										
	2											
	3											
	4											
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U _s	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722490
NORTHING: 6097498

PIT No: 39
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	TOPSOIL-moist, grey brown silty sand with roots and rootlets		D	0.05							
		SILTY SAND-dense, dry to moist, light red brown silty sand, fine to medium grained		D	0.2							
	0.45	SILTY GRAVELLY SAND-dense, dry to moist, yellow brown silty gravelly sand, fine to coarse grained, rounded quartz gravel		D	0.5							
	1			D	1.0							
	1.1	Pit discontinued at 1.1m -limit of investigation										
	2											
	3											
	4											
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _s	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _L	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Queanbeyan-Palerang Regional Council
PROJECT: Proposed Residential Development
LOCATION: Lot 1 DP 798111, North Bungendore

SURFACE LEVEL: N/A
EASTING: 722481
NORTHING: 6097490

PIT No: 40
PROJECT No: 88336.01
DATE: 1/6/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.25	TOPSOIL-moist, light grey brown silty sand with roots and rootlets		D	0.05							
				D	0.2							
	0.6	GRAVELLY SILTY SAND-medium dense, moist, light red brown gravelly silty sand, fine grained, rounded gravel up to 30mm in size		D	0.5							
				D	1.0							
	1.1	SILTY GRAVELLY SAND-dense, dry to moist, light yellow and grey brown, fine to medium grained, rounded gravel										
	1.1	Pit discontinued at 1.1m -limit of investigation										
	2											
	3											
	4											
		N/A - Survey data was not available at time of investigation. Logs will be re-issued with surface levels once survey has been completed.										

RIG: Kubota KX057-4 mini-excavator fitted with a 300mm wide bucket

LOGGED: AZR

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U _s	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W _s	Water seep	S	Standard penetration test
E	Environmental sample	W _L	Water level	V	Shear vane (kPa)