Aitken Rowe
GEOTECHNICAL ENGINEERING

Geotechnical Engineering
Environmental Consultancy
Soil Concrete Aggregate Testing
NATA Accredited Laboratories

ABN 53 058 315 138 ACN 058 315 138

4 December 2023 Reg. No.: GS23-344

Joss Construction
PO Box 7079
Albury, NSW 2640

Attention: Mr. Martin Reid – Development Manager

Dear Sir,

GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN - PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT, LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW

Further to your request in response to our quotation, Q23-530 dated 5 September 2023, the field investigation was carried out at the proposed location of the proposed multi-story residential development at the above site on 19 and 21 September 2023.

The purpose of the investigation was to determine the nature of the subsurface soil and groundwater conditions by augering, sampling and testing across the proposed site of the development. Based upon the information obtained, comments and recommendations for the proposed development including pavement design options are to be made.

It is noted that the proposed development includes the construction of a multi-story residential apartment building with associated on-grade car parking and pavement areas. The proposed apartment building is to comprise of 4 stories with 39 car parking spaces below the building footprint.

1.0 SITE DESCRIPTION

The site for the proposed development is located at DP 1224710, Lot 1, No. 65-67 Railway Street, Griffith, NSW. The site is bound by Railway Street to the south, Ulong Street to the west, an existing railway line to north and the multi-story Quest apartment building to the east as shown in the attached site location plan. The site is noted to be generally flat and covered with sparse vegetation overlying fill as noted at the time of the investigation.

The area was previously utilised as a locomotive workshop with turntable, locomotive sheds, engineering facilities and coal stages/platform areas. The coal stages were used to remove coal ash from the locomotives where the material would then be stored in a series of ash pits. Two large tanks that were reportedly used for water storage were also housed in this area. All of these facilities were noted to be removed or demolished in the 1970's.

2.0 SITE GEOLOGY

The general topography of the area is flat, gently undulating low tablelands. The Griffith area is underlain by the middle Devonian Cocoparra Group sediments largely obscured by residual and alluvial deposits comprising silt, sand and clays in accordance with 1:250,000 Scale "Metallogenic Series Sheet SI/55-10 for Narrandera".

The borehole investigation revealed the site is generally underlain by fill and natural alluvium material comprising sand-based, silt-based and clay-based material.

3.0 INVESTIGATION PROCEDURE

3.1 Fieldwork

The fieldwork was carried out on 19 and 21 September 2023 by the Senior Geotechnical personnel of Aitken Rowe Testing Laboratories Pty Ltd from Griffith and Wagga Wagga, NSW, who nominated the sampling and prepared engineering logs of the boreholes.

The fieldwork for the investigation consisted of the logging and sampling of nine (9) boreholes (BH1 to BH9) across the subject site which consisted of four (4) boreholes (BH1 to BH4) to the depth of 6.0m, four (4) boreholes (BH5 to BH8) to the depth of 1.5m across the building site and one (1) borehole (BH9) at the proposed landscape are to the depth of 1.5m and they were augered with our trailer mounted drilling rig at the locations as shown in the attached borehole and DCP test location plan. Small and bulk samples were recovered at various depths from the boreholes for relevant laboratory testing.

The boreholes were advanced through the soil profile using solid flight augers with Dynamic Cone Penetrometer (DCP) tests undertaken in the upper profile at eight (8) borehole locations (BH1 to BH8) with Standard Penetration Tests (SPT) also undertaken at 1.5m intervals from the depth of 1.5m to 4.5m below the existing surface level at the location of BH1 to BH4 to assess the strength, consistency and density of the subsoil materials.

The detailed borehole logs incorporating SPT results and materials schedule and logs with explanatory note are herewith attached. The DCP test reports are also herewith attached. The descriptions in the borehole logs and materials schedule and logs are provided in accordance with "AS 1726 – 2017 Geotechnical site investigation".

3.2 Laboratory Testing

The laboratory tests included particle size distribution, field moisture content (FMC) determination, Atterberg Limit, Linear Shrinkage (LS), Standard Maximum Dry Density (SMDD) and California Bearing Ratio (CBR) on the recovered soil samples from the boreholes and they were carried out at our NATA accredited testing laboratory in Griffith, NSW. The samples for CBR testing were compacted at 95% of Standard Maximum Dry Density (SMDD) and at nearest 100% of Standard Optimum Moisture Content (SOMC) and soaked for 10 days.

The test report on particle size distribution, FMC determination, Atterberg Limit, LS, SMDD, SOMC and CBR tests are herewith attached. The LS, FMC, SOMC and CBR test results are also incorporated in the respective borehole logs and materials schedule and logs.

The pH, electrical conductivity (EC), chloride and sulphate content and resistivity tests were also carried out on two (2) recovered samples from the boreholes at the Sydney Environmental and Soil Laboratory (SESL) in Sydney, NSW. The test reports as received from SESL are herewith attached.

Contamination analysis was also carried out on recovered samples at the subject site. The samples were analysed for the following by EnviroLab Services Pty Ltd, a NATA accredited laboratory in Sydney, NSW;

- Metals – Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc;
- Total Polycyclic Aromatic Hydrocarbons (PAH)
- Benzo(a)pyrene
- Benzene
- Toluene
- Ethyl-benzene
- Xylene
- Total Recoverable Hydrocarbons C_{10}-C_{36} (TRH)
- Electrical Conductivity (EC)
- pH

The test reports as received from EnviroLab Services Pty Ltd are herewith attached.

4.0 SUBSURFACE CONDITION

4.1 Proposed Building, Car Park and Pavement Areas

BH1 to BH8 cover the proposed building, car park and pavements areas across the subject site (refer to attached borehole & DCP test location plan). The boreholes drilled revealed that the site is underlain by fill material comprising topsoil, gravel-based, silt-based, clay-based and ash material to the depth of 0.45m to 0.9m (refer to attached borehole logs and materials schedule & logs) overlying natural alluvium material comprising low plasticity sandy clayey silt and clayey silt, low to medium and medium plasticity sandy silty clay, medium plasticity sandy clay and silty clay and medium, medium to high and high plasticity clay and fine to coarse grained clayey sand, extending

to the borehole termination depth at 6.0m in BH1 to BH4 and 1.5m in BH5 to BH8 (refer to attached borehole logs and materials schedule & logs). The fill material encountered at the location of BH1 to BH8 appeared to have been placed “uncontrolled” and “poorly to moderately compacted”.

The moisture condition of the underlying natural alluvial material was generally greater than plastic limit throughout the silt-based and clay-based profile within the investigation depth in BH1 to BH8 and wet throughout the sand-based profile where encountered within the investigated depth in BH4 at the time of the investigation.

Seepage was encountered during the drilling at the depth of 2.7m to 3.3m and 5.5m to 6.m (borehole termination depth) in BH1, 2.7m to 3.1m and5.5m to 6.0m (borehole termination depth) in BH2, 2.7m to 3.2m and 3.7m to 5.5m in BH3 and 2.6m to 3.1m and 3.5m to 4.2m in BH4 measured from the existing surface level at the time of the investigation. No groundwater or seepage was encountered during the course of drilling at the location of BH5 to BH8 within the investigation depth at the time of the investigation. However, it should be noted that the water table level could fluctuate with changes to the season, temperature and rainfall.

As per the DCP and SPT test results and visual observation of the resistance by auger TC bit, the underlying natural alluvial material is assessed to be generally ranging from firm consistency throughout the upper clay-based profile to the depth of 0.7m to 1.3m then increasing to stiff, very stiff, very stiff to hard and hard consistency throughout the underlying clay-based and silt-based profile within the investigation depth in BH1 to BH4 and dense within the sand-based profile where encountered in BH4 within the investigated depth at the time of the investigation (refer to attached borehole logs).

As per the DCP test results and visual observation of the resistance by auger TC bit, the underlying natural alluvial material is assessed to be generally stiff consistency in the upper clay-based profile then increasing to stiff to very stiff consistency throughout the underlying clay-based profile within the investigation depth in BH5, very soft consistency in the upper clay-based profile to the depth of 0.8m then increasing to stiff and very stiff consistency throughout the underlying clay-based profile within the investigation depth in BH6, soft consistency in the upper clay-based profile to the depth of 1.2m then decreasing to very soft consistency throughout the underlying clay-based profile within the investigation depth in BH7 and firm consistency in the upper clay-based profile to the depth of 0.9m then increasing to stiff to very stiff and very stiff consistency with depth throughout the underlying clay-based profile within the investigation depth in BH8 at the time of the investigation (refer to attached materials schedule & log).

The borehole logs incorporating SPT results and the materials schedule and logs with explanatory note and DCP test reports are herewith attached.

4.2 Proposed Landscape Area

BH9 covers the proposed landscape across the subject site (refer to attached borehole & DCP test location plan). The borehole drilled revealed that the site is underlain by fill material comprising

topsoil to 0.1m and clay-based material to the depth of 0.9m overlying natural alluvium material comprising medium to high plasticity clay, extending to the borehole termination depth at 1.5m in BH9 (refer to attached materials schedule & log). The fill material encountered at the location of BH9 appeared to have been placed “uncontrolled” and “poorly to moderately compacted”.

The moisture condition of the underlying natural alluvial material was generally greater than plastic limit throughout the clay-based profile within the investigation depth in BH9 at the time of the investigation. No groundwater or seepage was encountered during the course of drilling at the location of BH9 within the investigation depth at the time of the investigation. However, it should be noted that the water table level could fluctuate with changes to the season, temperature and rainfall.

As per the visual observation of the resistance by auger TC bit, the underlying natural alluvial material is assessed to be generally stiff to very stiff consistency throughout the clay-based profile within the investigation depth in BH9 at the time of the investigation (refer to attached materials schedule & log).

The materials schedule and log with explanatory note is herewith attached.

5.0 DISCUSSIONS AND COMMENTS

5.1 Site Preparation and Earthworks

The fill material encountered across the site appeared to have been placed “uncontrolled” and therefore considered “not suitable” to use as subgrade or foundation of any structure in its current state. We therefore recommend removal of this material in the areas of the proposed building and pavement areas and replace and re-compact with approved fill material in such a way that it achieves a minimum of 100% of Standard Maximum Dry Density (SMDD) for the proposed buildings and 98% SMDD for the proposed pavement areas as required if it is to be used as subgrade or foundation for the proposed development.

In general, the following site preparation is recommended once cuts if required are undertaken for the proposed buildings and pavement areas.

- Remove topsoil, fill and unsuitable material including silt-based and ash material, if any, and stockpile for later use for landscaping and backfilling as appropriate. An average stripping depth of 0.45m to 0.9m is anticipated for fill including ash material.
- Once the fill, topsoil and unsuitable materials are removed as required, the exposed natural subgrade should then be scarified to a depth of about 200mm; moisture conditioned to within 0 to -2% of Standard Optimum Moisture Content (SOMC) and compacted to a minimum of 98/100% of Standard Maximum Dry Density (SMDD) or 75/80% Density Index (DI).
- **It should be noted that the underlying silt-based material may become “unsuitable” and difficult to compact once exposed and subjected to moisture ingress due to its silt and**

fine sand characteristics. Care shall therefore be exercised during the process of the preparation (refer to attached borehole logs & material schedule & logs for depth and location).

- Proof roll the exposed subgrade using a minimum of 10 passes of 12 tonne dead weight roller to detect any soft, loose or heaving areas. **It should be noted the natural clay-based material was noted to be firm consistency in the upper profile to the depth of 0.7m in BH2, 0.8m in BH2, 1.1m in BH3, 1.3m in BH4, 0.9m in BH5 and BH8, very soft consistency to 0.8m in BH6 and soft and very soft consistency to 1.5m (borehole termination depth) in BH7 below the existing surface level at the time of the investigation (refer to attached borehole logs & materials schedule & logs). It should also be noted that surface movement on the very soft, soft and firm consistency clay-based subgrade may be experienced during the construction. This material may be required to be removed and or treated as required prior to the placement of any fill material.**
- Any soft, loose or heave areas, if detected, should be excavated down and backfilled with appropriate approved materials, compacted in 150mm thick layers to the equivalent density of minimum 98/100% of SMDD or 75/80% of Density Index. **It should also be noted that the depth of affected material may be varied across the site depending on the climatic condition at the time of the construction.**
- Any area of exposed subgrade, which exhibits shrinkage cracking and does not require re-compaction, should be watered and rolled until the shrinkage cracks do not reappear. During this undertaking, care should be exercised to ensure the surface does not become soft.

Subsequent to the above subgrade preparation, clean approved fill preferably granular materials can be placed as required and compacted to the compaction requirements as given above. The degree of compaction of any fill placement should be verified by a NATA accredited testing authority to ensure that it achieves the specified density. As the fill is to be laid on the silt-based or clay-based formation, the compaction shall be carried out with minimum amount of water required to achieve the required density. **It should be noted that the silt-based material may expose difficulties in compacting due to its high silt/fine sand content and nature of the material therefore may cause difficulties.**

The boundaries of the fill areas should be sloped to a maximum batter of 1.0 Vertical to 2.0 Horizontal as required or retained with a properly designed retaining wall.

The structural fill supporting any structural element of the structures shall be prepared in such a way that it achieves a minimum of 100% of Standard Maximum Dry Density or 80% of Density Index in every 150mm thick compacted layers and certified by a relevant NATA accredited testing laboratory for which a safe allowable bearing pressure of 100kPa may be adopted, provided proper drainage measures are incorporated in the design, during and after the construction.

It is highly recommended to undertake the construction of fill pads under Level 1 supervision in accordance with "AS3798 – 2007 – Guidelines on earthworks for commercial and residential developments" if fill pads are to be used for the foundation of any structure.

If the subgrade is to be stabilised then the exposed natural clay-based and silt-based subgrade should be stabilised with lime or slag-lime and the sand-based material with cement-based or slag-cement based additive as required. It is anticipated that mixing 3% of appropriate additive to the soil material should provide required strength for the subgrade. However, we strongly recommend laboratory trial tests to ensure specified strength is achieved through stabilisation.

It would be essential to maintain drainage of the site area during any earthworks to prevent rainfall from adversely affecting the materials such that they become unsuitable for direct re-use.

5.2 Excavation & Support and Retaining Wall

If any cut or excavation is required for the proposed development, then based upon the subsurface conditions encountered in the boreholes, it is expected that the materials to be excavated will comprise layers of topsoil, fill, if any and natural alluvial silt-based, clay-based and sand-based material depending on the extent of the proposed cut or excavation. It is therefore anticipated that all the required earthworks within the alluvial soil material should be capable of being performed by conventional earthmoving plant such as scrapers, dozers, rollers and backhoes or excavator within the investigated depth.

It would be essential to maintain drainage of the site area during any earthworks to prevent rainfall from adversely affecting the materials such that they become unsuitable for direct re-use. It should be noted that trafficability in the silt-based and clay-based materials for wheeled vehicles can be expected to be difficult during and following rainfall once it is exposed.

The temporary batter slopes of 1(V): 1(H) are recommended for unsupported cuts of up to 3.0m depth within natural alluvial material.

The followings are recommended for permanent batter slopes for unsupported cuts of up to 3.0m in depth in the following material:

- Natural Alluvium Soils 1(V): 2(H)

The permanent batter slope of the unsupported structural fill of up to 3.0m in height should not exceed 1(V): 2(H).

If vertical cut with equivalent retaining wall design option is to be adopted, the following characteristic earth pressure coefficients and subsoil parameters given in Table 1 may be adopted for the design of the wall.

Table 1 Design Parameters – Retaining Wall

Design Parameters	Natural Soil, Controlled Fill
Bulk Unit Weight	17.5 kN/m^3
Active Earth Pressure Coefficient, K_a	0.4
At rest Earth Pressure Coefficient, K_o	0.6
Passive Earth Pressure Coefficient, K_p	2.4
Effective cohesion, c'	0.0
Effective Friction Angle, ϕ' (average)	24•
Average undrained shear strength (for clay-based material)	45

An appropriate factor of safety should be applied in the design of the walls. The walls should be designed to withstand full hydrostatic pressure unless special measures are taken to introduce complete and permanent drainage of the ground behind the wall. It should be noted that similar design parameters may be used for the fill embankment provided similar quality material to the natural soil is used for the fill and the fill placement is placed under Level 1 supervision in accordance with "AS 3798 – 2007 – Guidelines on earthworks for commercial and residential developments".

Any excavation depth exceeding 1.5m should have benches of at least 1.0m wide at 1.5m height intervals. It should be noted that surcharge loadings should not be placed within a distance equivalent to the excavation depth form the crest of a batter cut or fill.

Care would be required to ensure excavation faces are cleaned of loosened and remoulded debris as it would be exposed to the alluvial soil materials. The exposed subgrade base should be proof rolled to detect any soft, loose or heaving areas. Any soft, loose or heave areas should be removed. The excavation base, particularly for clay-based material, should not be left exposed for prolonged periods as deterioration of bases may occur when subjected to wetting and drying processes. Care should be exercised during construction to ensure water ponding does not occur since this may lead to subsequent softening of the founding materials, particularly for the clay-based foundation.

As seepage was observed within the investigated depth in the boreholes drilled (refer to attached borehole logs BH1 to BH4) during the site investigation, it would be prudent to expect some seepage, even at shallower depth, particularly if excavation is carried out after periods of extreme rainfall. Any such seepage should be readily controllable by conventional sump and pump dewatering systems installed at the base of the excavation.

The excavated sand-based and gravel-based material can be used as structural fill provided the material is free from ash and other contaminants. The excavated alluvial clay-based material may be used as common fill and the silt-based material recommended only to be used as topdressing for landscaped areas.

It should be noted that, no matter what method of excavation support is used, some ground displacement will occur within and immediately surrounding the excavation. We recommend that the risk of architectural and structural damage to the nearby structures and buried services as a result of such excavation-induced movements, be carefully evaluated. We believe it is unlikely that excavation induced movements will significantly affect structures situated back from the excavation perimeter a distance greater than the excavation depth.

It is anticipated that the natural clay-based material would be stable during the excavation where the clay-based material is assessed to be equal to stiff consistency or better. However, instability or side collapse may be experienced within any "uncontrolled" fill and natural alluvial sand-based material and very soft, soft and firm consistency silt-based or clay-based material if the excavation is undertaken through these materials and therefore care and caution shall be exercised throughout the construction (refer to attached borehole logs and materials scheduled and logs).

5.3 Proposed Building Foundation

It is assessed that the "uncontrolled" fill material encountered across the site is considered "unsuitable" for any structural element of the footing system in its current state. Therefore, based on the available data, the site shall be classified as **"Class P – Problem"** site in accordance with Australian Standard "AS 2870-2011 – Residential slabs and footings".

However, if the "uncontrolled" fill material is removed and replaced with approved structural fill and re-compacted in such a way that it can be established as "controlled fill" as specified in Section 5.1 above or all the footings (i.e. edge beams internal beams and load support thickenings) are founded on the natural stiff consistency or better clay-based material or medium dense or better sand-based material through fill material, then **"Class "M-D" - Moderately reactive deep drying"** classification may be adopted (the calculated characteristic surface movement (y_s) values noted to be above 20mm and below 40mm), **provided the subgrade is prepared as specified in Section 5.1.**

If fill placement is required across the site, it is highly recommended to place granular fill comprising mainly sand and well graded gravel as recommended above, but caution shall be exercised not to select a 'raw' or non-plastic material that may induce erosion. It should be noted that the clay soils are subject to saturation and shrink/swell problems. **The fill shall be placed in accordance with clause 6.4.1 & 6.4.2 of AS2870, or otherwise the site classification shall be reviewed.**

The shallow footings such as deep edge beam or pad and strip footings may be adopted and they may be proportioned for a maximum allowable bearing pressure of 100kPa and a subgrade reaction modulus (k) of 25kPa/mm founded on natural stiff consistency or better clay-based material at or below the minimum depth of 0.7m to 1.3m measured from the existing surface (refer to attached borehole logs) or on the prepared subgrade as specified in Section 5.1 provided proper drainage measures are incorporated during and after the construction.

The deep pad footing system, if adopted, may be taken into the underlying stiff to very stiff consistency or better clay-based material at or below the minimum depth of 0.9m to 1.6m measured

from the existing surface level (refer to attached borehole logs) as required and the footing system may be proportioned for an allowable bearing pressure of 150kPa.

Alternatively, the bored and cast-in-place pile footing system or driven pile footing system, if adopted, should be taken into the natural very stiff consistency or better clay-based or silt-based material or dense sand-based material and the design parameters given in Table 2 below may be adopted for the design of the footing system. It should be noted that the geotechnical design parameters given in Table 2 were estimated from the DCP and SPT test results and visual observation of the soil cuttings from the boreholes.

Table 2 Geotechnical Design Parameters

Location	Depth (m)	Material Description	ABP (kPa)	ASA (C) (kPa)	AOF (°)	USS (kPa)	Density (kN/m^3)
BH1	0.7-1.0	Sandy Silty Clay	100	10*	-	30	16.0
	1.0-1.5	Silty Clay	200	20*	-	60	17.0
	1.5-4.0	Clay/Sandy Clayey Silt	300	30*	-	90	18.0
	4.0-6.0#	Sandy Clayey Silt/Sandy Silty Clay	200	20*	-	60	17.0
BH2	0.8-1.1	Silty Clay	100	10*	-	30	16.0
	1.1-1.5	Silty Clay	200	20*	-	60	17.0
	1.5-3.0	Silty Clay/Sandy Silty Clay/Sandy Clayey Silt	250	25*	-	75	17.5
	3.0-5.5	Sandy Clayey Silt/Clayey Silt	300	30*	-	90	18.0
	5.5-6.0#	Sandy Silty Clay	200	20*	-	60	17.0
BH3	1.1-3.0	Sandy Silty Clay/Sandy Clayey Silt	200	20*	-	60	17.0
	3.0-5.5	Clayey Silt/Silty Clay	300	30*	-	90	18.0
	5.5-6.0#	Silty Clay	200	20*	-	60	17.0
BH4	1.3-1.5	Silty Clay	100	10*	-	30	16.0
	1.5-3.5	Sandy Silty Clay/Sandy Clayey Silt	300	30*	-	90	18.0
	3.5-4.2	Clayey Sand	300	30*	35	-	18.5
	4.2-6.0#	Silty Clay	300	30*	-	90	18.0

Note:

ABP - Allowable (End) Bearing Pressure
ASA(C) - Allowable Side Adhesion (Compression)
AOF - Angle of Friction
USS - Undrained Shear Strength
Density - Density (at in-situ moisture)
- The borehole termination depth.
* - The side adhesion within the top 2.0m depth of natural soil shall be ignored (cracked

zone taken as $0.5H_s$).

If uplift forces are to be assessed, the allowable side resistance on the footing system may be taken as equivalent to 50% of the allowable side adhesion values given above. It should be noted that a factor of safety (FOS) 2.5 was adopted for the bearing pressure and skin friction values given in Table 2 for the natural alluvial material.

If Pad/Column footing system is to be adopted, then footing size and depth shall be designed in such a way that it withstands lateral forces and overturning moments. **Care shall be exercised in adopting the recommended design parameters given above in respect to the influenced zone of footing system.**

The footing excavations in the silt-based and clay-based material should not be left exposed for prolonged period as deterioration of footing bases may occur when subjected to wetting and drying processes. Care should be exercised during construction to ensure water ponding does not occur since this may lead to subsequent softening of the founding materials. **Groundwater or seepage may be encountered during the footing excavation and any such seepage should be readily controllable by conventional sump and pump dewatering systems installed at the base of the excavation. In a situation of groundwater inflows during the foundation construction, correct underwater concrete placement technique should be adopted to ensure achievement of the specified concrete quality.**

The footing excavations shall be cleared off the debris and ponding water prior to the placement of the concrete in order to adopt the recommended design parameters. The bases of the pile shafts and footings must be clean and free of soft and loose material and the sides of bored pile holes where side adhesion is adopted must be free of smear prior to concreting. To achieve this, bases of bored pile holes should be cleaned using a cleaning bucket and the sides of the pile holes should be roughed to remove the smear zone associated with drilling, or the side adhesion values given above Table 2 should be reduced by 50%.

The bases of the pile shafts and footings must be clean and free of soft and loose material and the sides of bored pile holes where side adhesion is adopted must be free of smear prior to concreting. To achieve this, bases of bored pile holes should be cleaned using a cleaning bucket and the sides of the pile holes should be roughed to remove the smear zone associated with drilling, or the side adhesion values given above should be reduced by 50%.

The slab panel, internal beams and load support thickening may be founded on the natural ground or prepared fill subgrade as specified in Section 5.1 as required. The ground slab may either be suspended on the footing system or by ground bearing slab if required. For the latter, we recommend that the structure be supported on a stiffened raft placed on the natural ground or prepared fill subgrade, comprising a grid of reinforced beam cast integrally with the floor slab, with load bearing beams thickened to extend to the clay stratum as required in order to minimise the risk of significant damage from the reactive clay foundation. The maximum edge beam pressure of

the stiffened raft slab should not exceed the allowable bearing capacity of the underlying alluvial soil foundation or prepared fill of 100kPa.

A minimum of 100 mm thick of approved granular fill materials should be placed on the prepared subgrade before the construction of the slab to cater surface movements, such as shrink/swell movements as the natural clays are considered moderately to highly reactive.

If water ponds in the base of footings or the base founding materials are affected by moisture ingress, then this material should be excavated to expose the natural subgrade, which has not been exposed to moisture, and pour the concrete immediately. If a delay in pouring the concrete is anticipated, then a blinding layer should be placed over the base of the footing to prevent softening of the footing base.

It is highly recommended to incorporate proper drainage measures around the perimeter of the structure to ensure surface run-off does not ingress into the founding material. It is also highly recommended that the footing excavations shall be inspected by experienced geotechnical personnel to ensure they achieve the above recommended bearing pressures.

5.4 Settlement

It is anticipated that the total settlements should be minimal provided the design is made within the allowable design parameters recommended and the maintenance of the structures and proper drainage measures are adopted around the structures.

Shallow footings proportioned in accordance with design parameters recommended above are estimated to have load induced settlements of no greater than 0.75% of the width of the footing.

Pile foundations designed in accordance with design parameters recommended above are estimated to have load induced settlements of no greater than 0.75% of the diameter of the piles. It is anticipated that differential settlement is likely to be less than 50% of the total settlement provided the footings are designed in accordance with the design parameters given above.

It should be noted that although the aforementioned design parameters given above are in terms of allowable limit, their use should be checked against settlement, using deformation characteristics values of the underlying clay material given in Table 3. It should be noted that differential settlement should not exceed 50% of the total settlement.

Table 3 Deformation Characteristics Values[1]

Parameters	Stiff Silt/Clay-Based	Stiff to Very Stiff Silt/Clay-Based	Very Stiff Silt/Clay-Based
Bulk Density (kN/m^3)	16.0	17.0	18.0
Elastic Modulus (Undrained) (MPa) -E_u	7.0	12.0	18.0
Coefficient of Volume Compressibility - (m^2/MN) - m_v	0.07	0.07	0.07

Note: 1 - These values are estimated from the field DCP & SPT test results and visual assessment of the recovered soil samples.

5.5 Soil Aggression

The two (2) pH tests indicated pH values of 8.7 and 8.8 were recorded on the underlying natural clay-based material and therefore considered "strong alkalinity". EC values of 0.11 and 0.24mS/cm were recorded on the on the same clay-based samples which are assessed to be "low salinity" and "slight salinity" respectively. The pH values on the clay-based material are considered "non-aggressive" towards concrete due to the impermeable nature of the clay-based material and "non-corrosive" towards steel.

The sulphate content values of 20 and 110mg/kg and chloride content values of 390 to 480mg/kg were noted on the same clay-based samples tested and they are considered generally "low". The low sulphate levels are considered "non-aggressive" towards concrete due to the impermeable nature of the clay-based material and the low chloride levels are considered "non-corrosive" towards steel.

The resistivity values of 7.1 and 8.9Ω.m were recorded on the same clay-based samples tested which are assessed to be "low resistivity". The "low resistivity" is considered to provide a "moderately aggressive" environment towards unprotected steel due to the impermeable nature of the clay-based material.

The designer is therefore referred to Section 4 of AS3600-2018 (Tables 4.3, 4.4, 4.8.1, 4.8.2, 4.8.3) and Section 6 of AS2159-2009 (Tables 6.4.2C, 6.4.3, 6.5.2C, 6.5.3) for any special precautionary measures required for buried concrete and steel elements into these materials.

5.6 Site Sub-Soil Class – Earthquake Design

The site sub-soil class in accordance with Section 4.2 of AS1170.4-2007 "Part 4: Earthquake actions in Australia", is assessed to be "Class C_e- Shallow soil site".

5.7 Subgrade - Car Park/Pavement Areas

The natural subgrade at the car park and pavement areas is underlain by alluvium material comprising low plasticity sandy clayey silt and clayey silt, low to medium and medium plasticity sandy silty clay, medium plasticity sandy clay and silty clay and medium, medium to high and high plasticity clay and fine to coarse grained clayey sand material (refer to attached borehole logs and materials schedule & logs).

The laboratory 10 day soaked CBR tests indicated CBR values of 4.0% on natural medium plasticity sandy silty clay and 4% on natural medium plasticity silty clay material, which were compacted at 95% of SMDD and at 100% SOMC. The in-situ CBR values correlated from DCP tests indicate CBR values ranging from <1 to 29% on the same natural subgrade material located in the upper profile.

It should be noted that in-situ CBR values correlated from the field tests (DCP test) are generally higher than laboratory 10 day-soaked CBR values. It should be appreciated that the CBR test results are directly related to the dry density and the water content of the materials. It is noted that the Optimum Moisture Content (OMC) at which the sample was compacted in the laboratory and the moisture content after soaking at which the sample was tested are generally higher than Field Moisture Content (FMC).

It is noted that the Griffith area has an average rainfall of less than 1000mm and the subgrade would be prepared as discussed in Section 5.1. Based on these evaluations and assumptions across the proposed car park and pavement areas, the design subgrade CBR value of 4.0% and a subgrade reaction modulus (k) of 25kPa/mm may be adopted for the design of the proposed car park and pavement areas at the subject site provided drainage measures are provided and maintained around the pavement throughout the pavement life.

5.8 Pavement Design - Proposed Car Park/Pavement Areas

The design parameters given in Table 4 below are adopted to calculate the design traffic as per advice and instruction given by the client representative, Mr. Martin Reid in an email dated 30 November 2023. The calculated design traffic for 20 years design life for the proposed car park and pavement areas is **1.99E+04 ESA.**

Table 4 Design Traffic Parameters

Design Parameters	Proposed Car Park/Pavement Areas
AADT 2023	120
Heavy Vehicle %	5.0%
Axle-pairs/vehicle	1.0
Annual growth	2.0%
Design reliability factor	1.0
Design Life	20 years
Use of Design Lanes %	100
ESA/HVAG	0.267 (Ref: Austroads 2017 Design Manual)
Cumulative number of heavy vehicle axle groups in the design lane during design period (Ndt)	7.45×10^4 HVAGs
Calculated Design Traffic (DESA)	**1.99×10^4 ESA**

In adopting the design subgrade CBR value of 4.0% as discussed above and the design traffic of 2.65E+04 ESA as calculated above, one of the following pavement designs, as a minimum, may be adopted.

Design Option 1 – Granular Pavement (TfNSW DGB20 & Local Quality) with Asphalt or 2 Coat Spray Seal

40mm Asphalt (AC14) – 2200MPa OR 7mm Primerseal followed by Single 14mm Seal OR 14/7mm Double Seal
100mm TfNSW DGB20 quality or equivalent (Ev= 350MPa)
210mm Local Quality DGS40 or equivalent (Ev=200MPa)
Subgrade CBR 4.0%

The above pavement will give a design life of 20 years, according to Circly 7.0 (24 August 2023), using the given parameters, provided proper drainage measures are incorporated at the site. It should be noted that no tolerance is allowed on pavement layers. **It should also be noted that the surface layer (bitumen seal or asphalt concrete) is not part of the structural design of the pavement.**

Design Option 2 – Granular Pavement (Local quality DGS20 & DGS40 Material) with Asphalt or 2 Coat Spray Seal

40mm Asphalt (AC14) – 2200MPa OR 7mm Primerseal followed by Single 14mm Seal OR 14/7mm Double Seal
110mm Local DGS20 material or equivalent (Ev=200MPa)
205mm Local DGS40 material or equivalent (Ev=200MPa)
Subgrade CBR 4.0%

The above pavement will give a design life of 21 years, according to Circly 7.0 (24 August 2023), using the given parameters, provided proper drainage measures are incorporated at the site. It should be noted that no tolerance is allowed on pavement layers. **It should also be noted that the surface layer (bitumen seal or asphalt concrete) is not part of the structural design of the pavement.**

Design Option 3 – Granular Pavement (TfNSW DGB20) with Asphalt or 2 Coat Spray Seal & Stabilised Subgrade

40mm Asphalt (AC14) – 2200MPa OR 7mm Primerseal followed by Single 14mm Seal OR 14/7mm Double Seal
175mm TfNSW DGB20 quality or equivalent (Ev= 350MPa)
250mm Stabilised subgrade layer (* stabilized with 3% based additive as appropriate) (Ev= 100MPa)
Subgrade CBR 4.0%

Note: * - The clay-based subgrade should be stabilized with lime additive as required. However, this should be confirmed with trial tests in the laboratory prior to adoption for the construction.

The above pavement will give a design life of 20 years, according to Circly 7.0 (7 November 2022), using the given design parameters, provided proper drainage measures are incorporated at the site. It should be noted that this does not allow any tolerance on pavement layers. **It should also be noted that the surface asphalt layer or bitumen seal layer is NOT part of the structural design of the pavement.**

Design Option 4 – Concrete Pavement

150mm Plain Concrete (Jointed/Reinforced)*
150mm Crushed Rock or Gravel
Subgrade CBR 4.0%

Note: * - The concrete specified in the above design should achieve the flexural strength of 3.5Mpa for 32Mpa compressive strength.

The above design should give a design life of 40 years. The provision of sub-base layer is to assist in controlling volume changes in moderately to highly expansive clay-based subgrade and to provide uniform support to the base concrete layer. The crushed rock or gravel material before addition of any additive should achieve a CBR of >20%, Maximum Liquid Limit (LL) of 25% and Plasticity Index (PI) of <6%. Appropriate jointing layout may be prepared in accordance with the requirements of "Industrial Floors and Pavements – Guidelines for design, construction and specification" by Cement and Concrete Association of Australia (2009).

5.9 Material Classification for Disposal

Eighteen (18) discrete samples were taken for analysis as part of the geotechnical investigation to initially classify the underlying soil material. The material classification has been completed as per the Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014: "The excavated natural material order 2014".

Each sample was analysed for the following:

- Metals – Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc;
- Total Polycyclic Aromatic Hydrocarbons (PAH)
- Benzo(a)pyrene
- Benzene
- Toluene
- Ethyl-benzene
- Xylene
- Total Recoverable Hydrocarbons C_{10}-C_{36} (TRH)
- Electrical Conductivity (EC)
- pH

The samples were sent to EnviroLab Services Pty Ltd, a NATA accredited laboratory in Sydney, NSW for analysis. The results are summarised in Table 5 below.

Table 5 Analytical Results Summary for Material Classification

No. of Samples	Analyte	Absolute Maximum Concentration (mg/kg) *ENM Order 2014*	Min. Result (mg/kg)	Max. Result (mg/kg)	Comply Y/N
18	Arsenic	40	<4	18	**Y**
	Cadmium	1	<0.4	0.7	**Y**
	Chromium	150	13	31	**Y**
	Copper	200	9	64	**Y**
	Lead	100	9	100	**Y**
	Mercury	1	<0.1	<0.1	**Y**
	Nickel	60	10	42	**Y**
	Zinc	300	12	140	**Y**
	Total PAH	40	<0.05	24	**Y**
	Benzo(a)pyrene	1	<0.05	1.8	**N**
	Benzene	0.5	<0.2	<0.2	**Y**
	Toluene	65	<0.5	<0.5	**Y**
	Ethyl-benzene	25	<1	<1	**Y**
	Xylenes	15	<1	<1	**Y**
	TRH (C_{10}-C_{36})	500	<50	120	**Y**
	pH (pH units)	4.5-10	6.7	9.2	**Y**
	EC (dS/m)	3	0.15	0.97	**Y**

As can be seen from Table 5, the concentration of Benzo(a)pyrene was found to be above the absolute maximum concentration in Sample No. 7B. It is noted that this material appears to be "moisture affected" and may be subject to high leaching in this area. It should be noted that the results for the remaining samples were found below the adopted criteria.

The **natural material** at the subject site may therefore be classified as **"Excavated Natural Material"** (ENM), **excluding the affected material in Sample No. 7B**. It is highly recommended to undertake additional testing in this area at the time of construction in order to determine the extent of the affected material.

The **affected natural material in Sample No. 7B and the underlying fill material** across the site shall be classified as **"General Solid Waste"** (GSW) in accordance with the NSW DECCW Waste Classification Guidelines Part 1: Classifying Waste (2014).

7.0 General Comment

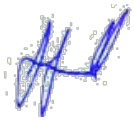
- Occasionally, the subsurface soil conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. This can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact us.
- The material specified as base and sub-base material as per above designs may be used provided the material meets all criteria as shown in Table 242.3 and 242.4 of AusSpec for NGB20, NGS20 or TfNSW DGB20/DGS20 and local DGS20/40 quality specification accordingly. It is therefore highly recommended to use those similar quality materials and to undertake on-going quality control tests to ensure that the material quality is maintained throughout the construction.
- If TfNSW DGS20 or local DGS quality material is used in lieu of TfNSW DGB20 material as the base layer, the likelihood of the following will increase:
    - Early rutting of the pavement base layer.
    - The asphalt fatigue life will be relatively shorter as the asphalt fatigue life is a function of the stiffness of the upper pavement layer.
    - Additional allowances for aggregate embedment would be required to prevent early seal damage such as aggregate loss and subsequent flushing.
    - A more robust spray seal using multigrade or PMB binders should be considered.
    - Surface damage and potholing is considered more likely as the TfNSW DGS20 or local DGS quality material would be more susceptible to plasticity and moisture problems compared to TfNSW DGB20 materials.
- The pavement materials shall be compacted to a minimum of 102% SMDD for base and 100% SMDD for sub-base and select fill or as per Council Specification.
- It is highly recommended that an adequate drainage system should be formed to maintain constant moisture conditions in the pavement and subgrade below the pavement. It is also highly recommended to place interface trench drain at the joints between existing and new pavement if the existing materials are found to be different from new materials, particularly

if the existing or new pavement has a stabilised layer. The trench drain of 300x300mm shall be placed below stabilised layer and be extended to about 300mm.

- The subsurface drainage system must be designed by a qualified drainage engineer/Civil Design Engineer (Refer Austroads Publication "Guide to Road Design Part 5A (2013): Drainage – Road Surface, Networks, Basins and Subsurface"). It should be noted that the subsurface drainage system must be extended to a minimum depth of 300mm below final design subgrade level.
- It should be noted that site preparation may expose wet subgrade material if excavation is carried out after prolonged periods of rainfall. Trafficability in the silt-based and clay-based materials for wheeled vehicles can be expected to be slightly difficult during and following rainfall if it is exposed. Caution shall therefore be exercised during the construction.

Should you have any queries, please do contact us.

Yours truly,



Jarrod Gornall
Senor Geotechnical Engineer

Tin Maung
Principal Geotechnical Engineer

Attachments:

- Addendum
- Site Location Plan
- Plan showing Borehole & DCP test locations
- Borehole & Materials Schedule Logs with Explanatory Note
- Dynamic Cone Penetrometer test reports
- Laboratory test reports by Aitken Rowe Testing Laboratories Pty Ltd
- Laboratory test report by Sydney Environmental & Soil Laboratory Pty Ltd
- Laboratory Test Report by EnviroLab Pty Ltd
- Design Traffic Calculation Sheet
- Circly Design Print-outs

ADDENDUM

LIMITS OF INVESTIGATION

The recommendations made in this report are based on the assumption that the test results are representative of the overall subsurface conditions. However, it should be noted that even under optimum circumstances, actual conditions in some parts of the building site may differ from those said to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal all that is hidden by earth, rock and time.

The client should also be aware that our recommendations refer only to our test site locations and the ground level at the time of testing.

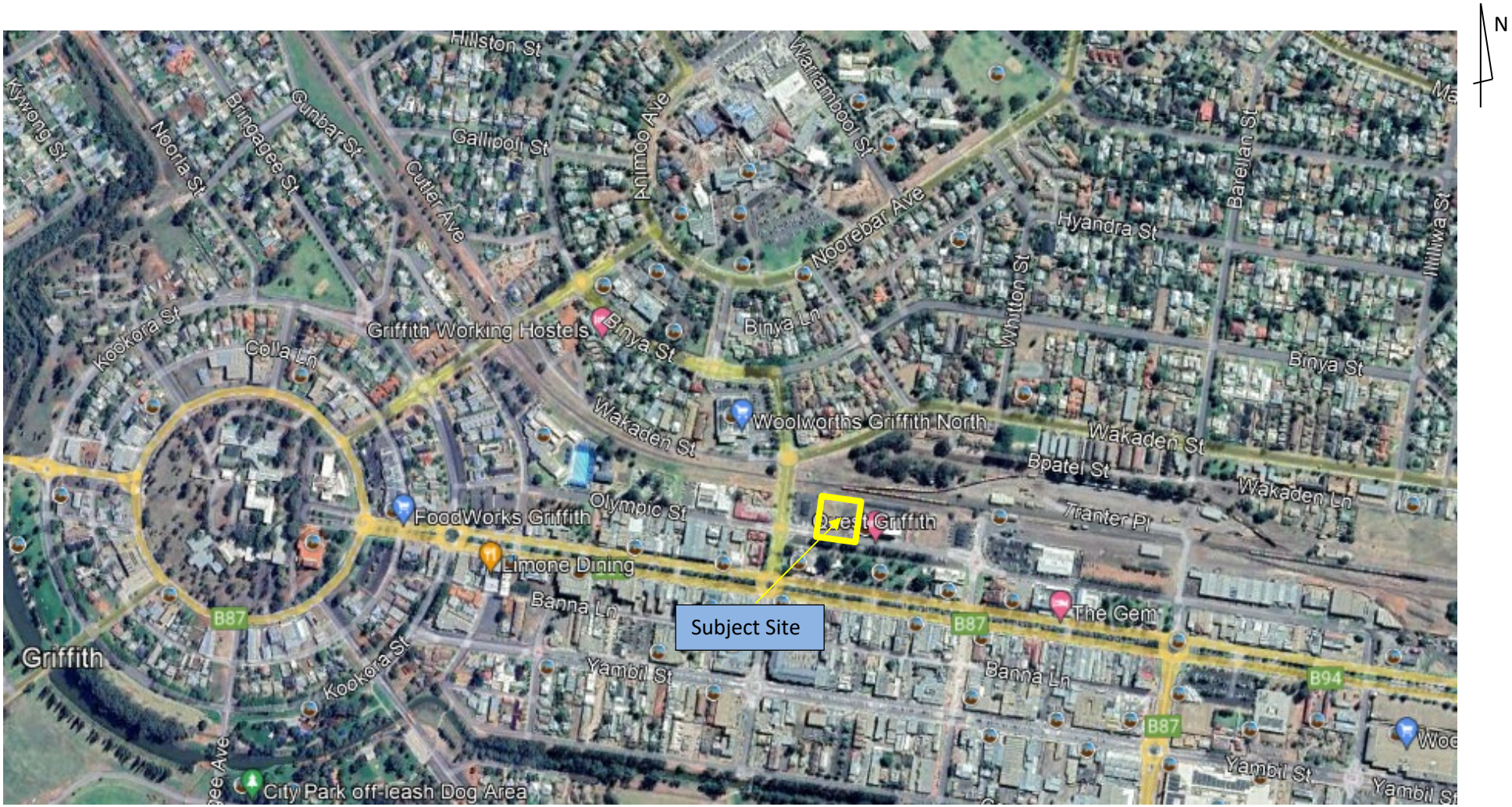
The recommendations in this report are based on the following: -

a) The information gained from our investigation.
b) The present "state of the art" in testing and design.
c) The building type and site treatment conveyed to us by the client.
d) Historical information.

Should the client or their agent have omitted to supply us with the correct relevant information, or make significant changes to the building type and/or building envelope, our report may not take responsibility for any consequences and we reserve the right to make an additional charge if more testing is necessary.

Not withstanding the recommendations made in this report, we also recommend that whenever footings are close to any excavations or easements, that consideration should be given to deepening the footings.

Unless otherwise stated in our commission, any dimensions or slope direction and magnitude should not be used for any building costing calculations and/or positioning. Any sketch supplied should be considered as only an approximate pictorial evidence of our work.



Google Earth Image Dated 9 March 2023

Aitken Rowe Testing Laboratories Pty Ltd

Registration Number: GS23-344

Client: JOSS CONSTRUCTION – ALBURY, NSW

Project: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT,
LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW
SITE LOCATION PLAN

Google Earth Image Dated 9 March 2023

Aitken Rowe Testing Laboratories Pty Ltd

Registration Number: GS23-344

Client: JOSS CONSTRUCTION – ALBURY, NSW

Project: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT,
LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW
BOREHOLE & DCP TEST LOCATION PLAN

AITKEN ROWE TESTING LABORATORIES PTY LTD

Borehole No.: **1**
Sheet No.: 1 of 1

Ground Level: Existing
Method: Auger Drilling with TC Bit

Date: ***19/09/2023***
GPS N: ***6205646***
E: ***0412087***

USCS Symbol	Description	Depth (m)	Moisture Condition	Consistency/ Rel. Density	Sample Type	Sample No.	Field Test SPT	Remarks & Field Records
GM	FILL: Silty Sandy GRAVEL; fine to coarse grained, fine to coarse sand, fines of low plasticity, brown		D	MD				FILL: Appears moderately compacted 'Uncontrolled'
	FILL: ASH; with fine to coarse sand, with fine to coarse gravel, black	0.5	D-M	L-MD				FILL: Appears poorly compacted 'Uncontrolled'
CI	Sandy CLAY; medium plasticity, fine to coarse sand, trace gravel, orange		MC>PL	F				NATURAL
		1.0		St.	D	1A		1A Jar sample (Enviro)
CH	CLAY; high plasticity, with fine to coarse sand, trace gravel, brown orange			VSt.				
					D	1B		L.S = 13.0% FMC = 26.2%
		1.5					1.5	
				VSt.-H			SPT	
					D	1C	8, 14, 18	
		2.0					N = 32	
ML	Sandy Clayey SILT; low plasticity, fine to coarse sand, with fine to coarse gravel, orange brown						1.95	
					D	1D		1B Jar sample (Enviro)
		2.5						
								← Seepage @ 2.7m to 3.3m
							2.9	
		3.0					SPT	
					D	1E	12, 11, 17	L.S = 3.0%
							N = 28	← End of Seepage
ML	Sandy Clayey SILT; low lasticity, fine to coarse sand, grey brown	3.5					3.35	
		4.0		VSt.				
		4.5					4.5	
					D	1F	SPT 7, 7, 9	L.S = 7.0%
		5.0					N = 16	
							4.95	
		5.5						← Seepage @ 5.5m to 6.0m (EOBH)
CL	Sandy Silty CLAY; low plasticity, fine to coarse sand, with fine to coarse gravel, orange	6.0						

End of Borehole (BH1) @ 6.0m

Registration No.: GS23-344

Location: Geotechnical Investigation & Pavement Design - Proposed Multi-Story Residential Development, Lot 1, No. 65-67 Railway Street, Griffith, NSW

Client: Joss Construction - Albury, NSW

Logged By: T.L

Scale: As shown

Seepage @ 2.7m to 3.3m & 5.5m to 6.0m (EOBH)

AITKEN ROWE TESTING LABORATORIES PTY LTD

Borehole No.: **2**
Sheet No.: 1 of 1

Ground Level: Existing
Method: Auger Drilling with TC Bit

Date: ***21/09/2023***
GPS N: ***6205629***
E: ***0412102***

USCS Symbol	Description	Depth (m)	Moisture Condition	Consistency/ Rel. Density	Sample Type	Sample No.	Field Test SPT	Remarks & Field Records
CL	FILL: Gravelly Sandy CLAY; low plasticity, fine to coarse sand, fine to coarse gravel, brown		MC<PL	St.				FILL: Appears moderately compacted 'Uncontrolled'
ML	FILL: Gravelly Sandy SILT; low plasticity, fine to coarse sand, fine to coarse gravel, with ash, grey							FILL: Appears poorly compacted 'Uncontrolled'
	FILL: ASH; with fine to coarse sand, with fine to coarse gravel, black	0.5			D	2A		2A Jar sample (Enviro)
CL	Sandy Silty CLAY; low plasticity, fine to coarse sand, grey brown		MC>PL	F	D	2B		NATURAL 2B Jar sample (Enviro)
CI-CH	CLAY; medium to high plasticity, with fine to coarse sand, red orange	1.0		St.				
CI	CLAY; medium plasticity, with fine to coarse sand, orange brown	1.5		VSt.			1.5	
					D	2C	SPT 7, 10, 14 N = 24	L.S = 10.5% FMC = 14.8%
CI	Sandy CLAY; medium plasticity, fine to coarse sand, trace gravel, orange	2.0			D	2D	1.95	
ML	Sandy Clayey SILT; low plasticity, fine to coarse sand, trace gravel, orange	2.5			D	2E		L.S = 5.0% FMC = 17.9%
					D	2F	3.0	← Heavy Seepage @ 2.7m to 3.1m L.S = 4.0%
ML	Clayey SILT; low plasticity, with fine to coarse sand, grey	3.5		H	D	2G	SPT 14, 15, 25 N = 40 3.45	← End of Seepage
		4.0						
		4.5					4.5	
ML	Clayey SILT; low to medium plasticity, with fine to coarse sand, mottled grey red	5.0			D	2H	SPT 11, 13, 20 N = 33 4.95	L.S = 8.0%
		5.5						← Seepage @ 5.5m to 6.0m (EOBH)
CL	Sandy Silty CLAY; low plasticity, fine to coarse sand, with fine to coarse gravel, red	6.0		VSt.				

End of Borehole (BH2) @ 6.0m

Registration No.: GS23-344

Location: Geotechnical Investigation & Pavement Design - Proposed Multi-Story Residential Development, Lot 1, No. 65-67 Railway Street, Griffith, NSW

Client: Joss Construction - Albury, NSW

Logged By: T.L

Scale: As shown

Seepage @ 2.7m to 3.1m & 5.5m to 6.0m (EOBH)

AITKEN ROWE TESTING LABORATORIES PTY LTD

Borehole No.: **3**
Sheet No.: 1 of 1

Ground Level: Existing
Method: Auger Drilling with TC Bit

Date: ***19/09/2023***
GPS N: ***6205644***
E: ***0412117***

USCS Symbol	Description	Depth (m)	Moisture Condition	Consistency/ Rel. Density	Sample Type	Sample No.	Field Test SPT	Remarks & Field Records
GP	FILL: GRAVEL; fine to coarse grained, trace sand, trace fines of low plasticity, bro		D	MD				FILL: Appears moderately compacted 'Uncontrolled' 3A Jar sample (Enviro)
CL	FILL: Gravelly Sandy CLAY; low plasticity, fine to coarse sand, fine to coarse gravel, brown		MC<PL	VSt.	D	3A		
	FILL: ASH; with fine to coarse sand, with fine to coarse gravel, black	0.5	M	L-MD				FILL: Appears poorly compacted 'Uncontrolled'
CL	Sandy Silty CLAY; low plasticity, fine to coarse sand, red brown	1.0	MC>PL	F				NATURAL
				VSt.				
CI	Sandy CLAY; medium plasticity, fine to coarse sand, red brown	1.5			D	3B	1.5	L.S = 9.5%
ML	Sandy Clayey SILT; low plasticity, fine to coarse sand, orange brown				D	3C	SPT 8, 10, 11 N = 21	FMC = 25.8%
		2.0					1.95	
					D	3D		3B Jar sample (Enviro)
		2.5						← Heavy Seepage @ 2.7m to 3.2m
ML	Clayey SILT; low plasticity, with fine to coarse sand, with fine to coarse gravel, grey	3.0					3.0	
				H	D	3E	SPT 17, 28, 30 N = 58	L.S = 1.5% ← End of Seepage FMC = 18.1%
		3.5					3.45	
CI	Silty CLAY; medium plasticity, with fine to coarse sand, with fine to coarse gravel, brown grey				D	3F		← Moderate Seepage @ 3.7m to 5.5m
		4.0						
CI	Silty CLAY; medium plasticity, with fine to coarse sand, trace gravel, mottled orange brown grey							
		4.5					4.5	
					D	3G	SPT 12, 14, 16 N = 30	L.S = 9.5%
		5.0					4.95	
		5.5						← End of Seepage
CH	CLAY; high plasticity, with fine to coarse sand, mottled grey red			VSt.				
		6.0						

End of Borehole (BH3) @ 6.0m

Registration No.: GS23-344

Location: Geotechnical Investigation & Pavement Design - Proposed Multi-Story Residential Development, Lot 1, No. 65-67 Railway Street, Griffith, NSW

Client: Joss Construction - Albury, NSW

Logged By: T.L

Scale: As shown

Seepage @ 2.7m to 3.2m & 3.7m to 5.5m

AITKEN ROWE TESTING LABORATORIES PTY LTD

Borehole No.: **4**
Sheet No.: 1 of 1

Ground Level: Existing
Method: Auger Drilling with TC Bit

Date: ***19/09/2023***
GPS N: ***6205622***
E: ***0412135***

USCS Symbol	Description	Depth (m)	Moisture Condition	Consistency/ Rel. Density	Sample Type	Sample No.	Field Test SPT	Remarks & Field Records
GM	FILL: Silty Sandy GRAVEL; fine to coarse grained, fine to coarse sand, fines of low plasticity, orange		M	MD	D	4A		FILL: Appears moderately compacted 'Uncontrolled'
	FILL: ASH; with fine to coarse sand, with fine to medium gravel, black	0.5	D	L-MD	D	4B		FILL: Appears poorly compacted 'Uncontrolled' 4A Jar sample (Enviro)
CL	Sandy Silty CLAY; low plasticity, fine to coarse sand, brown red	1.0	MC>PL	F				NATURAL
	Sandy CLAY; medium plasticity, fine to coarse sand, red brown				D	4C		4B Jar sample (Enviro)
CH	CLAY; high plasticity, with fine to coarse sand, red brown	1.5		St.			1.5	
CI	Sandy Silty CLAY; medium plasticity, fine to coarse sand, trace gravel, orange brown			H	D	4D	SPT 17, 28, 30 N = 57	
		2.0			D	4E		L.S = 10.0%
CL-CI	Sandy Silty CLAY; low to medium plasticity, fine to coarse sand, trace gravel, orange brown						1.95	
		2.5			D	4F		L.S = 7.5%
								← Seepage @ 2.6m to 3.1m
		3.0					3.0	
					D	4G	SPT 16, 23, 30 N = 53	← End of Seepage
ML	Sandy Clayey SILT; low plasticity, fine to coarse sand, brown grey	3.5				4H		
SC	Clayey SAND; fine to coarse grained, trace gravel, fines of low plasticity, orange		W	D			3.45	← Seepage @ 3.5m to 4.2m
		4.0			D	4I		
								← End of Seepage
CI-CH	Silty CLAY; medium to high plasticity, with fine to coarse sand, trace gravel, orange brown		MC>PL	H			4.4	
		4.5			D	4J	SPT 15, 17, 18 N = 35	
		5.0					4.85	
		5.5						
					D	4K		
		6.0						

End of Borehole (BH4) @ 6.0m

Registration No.: GS23-344

Location: Geotechnical Investigation & Pavement Design - Proposed Multi-Story Residential Development, Lot 1, No. 65-67 Railway Street, Griffith, NSW

Client: Joss Construction - Albury, NSW

Logged By: T.L

Scale: As shown

Seepage @ 2.6m to 3.1m & 3.5m to 4.2m

Aitken Rowe Testing Laboratories Pty Ltd

17b Battista Street, Griffith NSW 2680

Pavement & Subgrade Investigation - Materials Schedule and Log

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW

PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN

PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT, LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW

STAFF: T.L **SAMPLING METHOD :** AS1289.1.2.1 **CLAUSE :** 6.5.3

DATE: 21/09/2023

REGO. NO.: GS23-344

Borehole No. and Location	Layer Sample No.	Depth (mm)	Group Symbol	Field Description (layer, type, plasticity / particle size, colour, secondary components)	Moisture Conditions	Strength Comments	Moistures (FMC=Field MC) (OMC=Optimum MC) (FMC/OMC=Moisture Ratio)			Dynamic Cone Penetrometer (NB not equiv. to lab soaked CBR)		(CBR%)	Other Comments
							OMC	FMC	FMC/ OMC	Depth In Subgrade (mm)	Equiv. CBR %	10 day (95% Rel. Comp.)	
BH5	F5	0-100	SM	FILL: Silty SAND; fine to coarse grained, with fine to coarse gravel, fines of low	D	MD		3.4					FILL: Appears moderately compacted
N: 6205634				plasticity, grey									'Uncontrolled'
E: 0412120		100-250	ML	FILL: Gravelly Sandy SILT; low plasticity, fine to coarse sand, fine to coarse gravel,	MC<PL	St.							FILL: Appears poorly to moderately compacted
				with ash, grey									'Uncontrolled'
	5A (Jar)	250-400		FILL: ASH; with fine to coarse sand, with fine to coarse gravel, black	D-M	L-MD							FILL: Appears poorly compacted 'Uncontrolled'
		400-700	CI	FILL: Silty CLAY; medium plasticity, with fine to coarse sand, orange	MC<PL	F-St.							FILL: Appears poorly compacted 'Uncontrolled'
	5B (Jar)/FA5	700-900	CI	FILL: SIlty CLAY; medium plasticity, with fine to coarse sand, brown	MC>PL	F				700-900	3		FILL: Appears poorly compacted 'Uncontrolled'
	SG5A	900-1300	CI	Sandy Silty CLAY; medium plasticity, fine to coarse sand, red brown	MC>PL	St.	24.6	25.4	1.03	900-1500	11	4	NATURAL
		1300-1500	CI-CH	CLAY; medium to high plasticity, with fine to coarse sand, mottled yellow red	MC>PL	St.-VSt.							
				End of Borehole (BH5) @ 1.5m									
BH6		0-100	GM	FILL: Silty Sandy GRAVEL; fine to coarse grained, fine to coarse sand, fines of	D-M	MD							FILL: Appears moderately compacted
N: 6205637				low plasticity, grey									'Uncontrolled'
E: 0412097		100-250	ML	FILL: Gravelly Sandy SILT; low plasticity, fine to coarse sand, fine to coarse gravel,	MC<PL	St.							FILL: Appears poorly to moderately compacted
				with ash, black grey									'Uncontrolled'
	F6A (Jar)	250-450		FILL: ASH; with fine to coarse sand, with fine to coarse gravel, black	D-M	L-MD							FILL: Appears poorly compacted 'Uncontrolled'
	6A (Jar)	450-900	CI	Sandy Silty CLAY; medium plasticity, fine to coarse sand, brown	MC>PL	VS-St.				500-900	1		NATURAL
		900-1500	CI-CH	CLAY; medium to high plasticity, with fine to coarse sand, red orange	MC>PL	VSt.				900-1500	17		
				End of Borehole (BH6) @ 1.5m									

Aitken Rowe Testing Laboratories Pty Ltd

17b Battista Street, Griffith NSW 2680

Pavement & Subgrade Investigation - Materials Schedule and Log

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW

PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN

PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT, LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW

STAFF: T.L **SAMPLING METHOD :** AS1289.1.2.1 **CLAUSE :** 6.5.3

DATE: 21/09/2023

REGO. NO.: GS23-344

Borehole No. and Location	Layer Sample No.	Depth (mm)	Group Symbol	Field Description (layer, type, plasticity / particle size, colour, secondary components)	Moisture Conditions	Strength Comments	Moistures (FMC=Field MC) (OMC=Optimum MC) (FMC/OMC=Moisture Ratio)			Dynamic Cone Penetrometer (NB not equiv. to lab soaked CBR)		(CBR%)	Other Comments
							OMC	FMC	FMC/ OMC	Depth In Subgrade (mm)	Equiv. CBR %	10 day (95% Rel. Comp.)	
BH7		0-100	ML	FILL/TOPSOIL: Sandy SILT; low plasticity, fine to coarse sand, with fine to coarse	MC<PL	VSt.							FILL: Appears moderately compacted
N: 6205626				gravel, grey									'Uncontrolled'
E: 0412092		100-350	ML	FILL: Gravelly Sandy SILT; low plasticity, fine to coarse sand, fine to coarse gravel,	MC<PL	VSt.							FILL: Appears moderately compacted
				with ash, grey									'Uncontrolled'
	7A (Jar)	350-900		FILL: ASH; with fine to coarse sand, with fine to coarse gravel, black grey	D-M	L							FILL: Appears poorly compacted 'Uncontrolled'
	7B (Jar)	900-1200	CI	Silty CLAY; medium plasticity, with fine to coarse sand, with fine to coarse gravel,	MC>PL	S				900-1500	<1		NATURAL
				brown									
	SG7	1200-1500	CI	Silty CLAY; medium plasticity, with fine to coarse sand, brown	MC>PL	VS							
				End of Borehole (BH7) @ 1.5m									
BH8	8A (Jar)	0-200	GM	FILL: Silty Sandy GRAVEL; fine to coarse grained, fine to coarse sand, fines of low	D	MD							FILL: Appears moderately compacted
N: 6205659				plasticity, grey									'Uncontrolled'
E: 0412097		200-300	ML	FILL: Gravelly Sandy SILT; low plasticity, fine to coarse sand, fine to coarse gravel,	MC<PL	St.							FILL: Appears poorly compacted
				with ash, black									'Uncontrolled'
	F8	300-550	CI	FILL: CLAY; medium plasticity, with fine to coarse sand, with fine to medium gravel, orange	MC<PL	St.		18.6					FILL: Appears poorly compacted 'Uncontrolled'
	SG8A	550-900	CL-CI	Sandy Silty CLAY; low to medium plasticity, with fine to coarse sand, brown	MC>PL	F				500-900	4		NATURAL
	SG8B	900-1300	CI	Silty CLAY; medium plasticity, with fine to coarse sand, orange red	MC>PL	St.-VSt.	24.4	26.8	1.10	900-1500	29	4	
		1300-1500	CI	Silty CLAY; medium plasticity, with fine to coarse sand, orange	MC>PL	VSt.							
				End of Borehole (BH8) @ 1.5m									

Aitken Rowe Testing Laboratories Pty Ltd

17b Battista Street, Griffith NSW 2680

Pavement & Subgrade Investigation - Materials Schedule and Log

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW

PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN

PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT, LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW

STAFF: T.L **SAMPLING METHOD :** AS1289.1.2.1 **CLAUSE :** 6.5.3

PAGE: 3 OF 3

DATE: 21/09/2023

REGO. NO.: GS23-344

Borehole No. and Location	Layer Sample No.	Depth (mm)	Group Symbol	Field Description (layer, type, plasticity / particle size, colour, secondary components)	Moisture Conditions	Strength Comments	Moistures (FMC=Field MC) (OMC=Optimum MC) (FMC/OMC=Moisture Ratio)			Dynamic Cone Penetrometer (NB not equiv. to lab soaked CBR)		(CBR%)	Other Comments
							OMC	FMC	FMC/ OMC	Depth In Subgrade (mm)	Equiv. CBR %	10 day (95% Rel. Comp.)	
BH9	9A (Jar)	0-100	GM	FILL/TOPSOIL: Silty Sandy GRAVEL; fine to coarse grained, fines to coarse sand,	D	MD							FILL: Appears moderately compacted
N: 6205653				fines of low plasticity, grey									'Uncontrolled'
E: 0412128		100-350	CL	FILL: Sandy Silty CLAY; low plasticity, fine to coarse sand, with fine to coarse	MC<PL	St.							FILL: Appears poorly to moderately compacted
				gravel, brown grey									'Uncontrolled'
	9B (Jar)	350-600	CI	FILL: Silty CLAY; medium plasticity, with fine to coarse sand, brown	MC<PL	F-St.							FILL: Appears poorly compacted 'Uncontrolled'
		600-900	CI	FILL: Silty CLAY; medium plasticity, with fine to coarse sand, brown	MC>PL	F							FILL: Appears poorly compacted 'Uncontrolled'
		900-1500	CI-CH	CLAY; medium to high plasticity, with fine to coarse sand, red	MC>PL	St.-VSt.							NATURAL
				End of Borehole (BH9) @ 1.5m									

Form R21 Revised 26/03/2015

AITKEN ROWE TESTING LABORATORIES PTY LTD

LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record	▼	Standing water level. Time delay following completion of drilling may be shown.
	▶	Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	D	Disturbed bag sample taken between the depths indicated by lines.
	U	Undisturbed 50mm diameter tube sample taken between the depths indicated by lines
Field Tests	4, 7, 10 N=17	Standard Penetration Test (S.P.T.) performed between depths indicated by lines. Individual figures show blows per 150mm penetration driven by SPT hammer.
	5 7 3	Dynamic Cone Penetration Test performed between depths indicated by lines. Individual figures show blows per 100mm penetration for 60 degree solid cone driven by 9 kg hammer.
Moisture Condition (Silt or Clay based)	MC<PL	Moisture content estimated to be less than plastic limit.
	MC=PL	Moisture content estimated to be approx. equal to plastic limit.
	MC>PL	Moisture content estimated to be greater than plastic limit.
Moisture Condition (Gravel or Sand based)	D	DRY – runs freely through fingers.
	M	MOIST – does not run freely but no free water visible on soil surface.
	W	WET – free water visible on soil surface.
Consistency (Silt or Clay based)	VS	VERY SOFT – unconfined compressive strength less than 25kPa.
	S	SOFT – unconfined compressive strength 25-50 kPa.
	F	FIRM – unconfined compressive strength 50-100kPa.
	St.	STIFF – unconfined compressive strength 100-200kPa.
	VSt.	VERY STIFF – unconfined compressive strength 200-400kPa.
	H	HARD – unconfined compressive strength greater than 400kPa.

Relative Density (Gravel or Sand based)		Description	Density Index Range %	'N' Value Range Blows/300mm
	VL	VERY LOOSE	<15	0-5
	L	LOOSE	15-35	6-10
	MD	MEDIUM DENSE	35-65	11-30
	D	DENSE	65-85	31-60
	VD	VERY DENSE	>85	>60

Hand Penetrometer Readings	300 250 280	Numbers indicate individual test results in kPa on representative undisturbed material.
Laboratory Test	L.S. %	Linear Shrinkage (As per TfNSW Method T113)
	M.C. %	Field Moisture Content (As per Australian Standard AS1289.2.1.1 or TfNSW Method T120)
	Iss	Shrink-Swell Index (As per Australian Standard AS1289.7.1.1)

Piezometer Construction	Fill		Piezometer	
		Bentonite		Solid Pipe
		Washed Fine Graded Gravel		Slotted Screen

Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Tungsten Carbide wing bit.

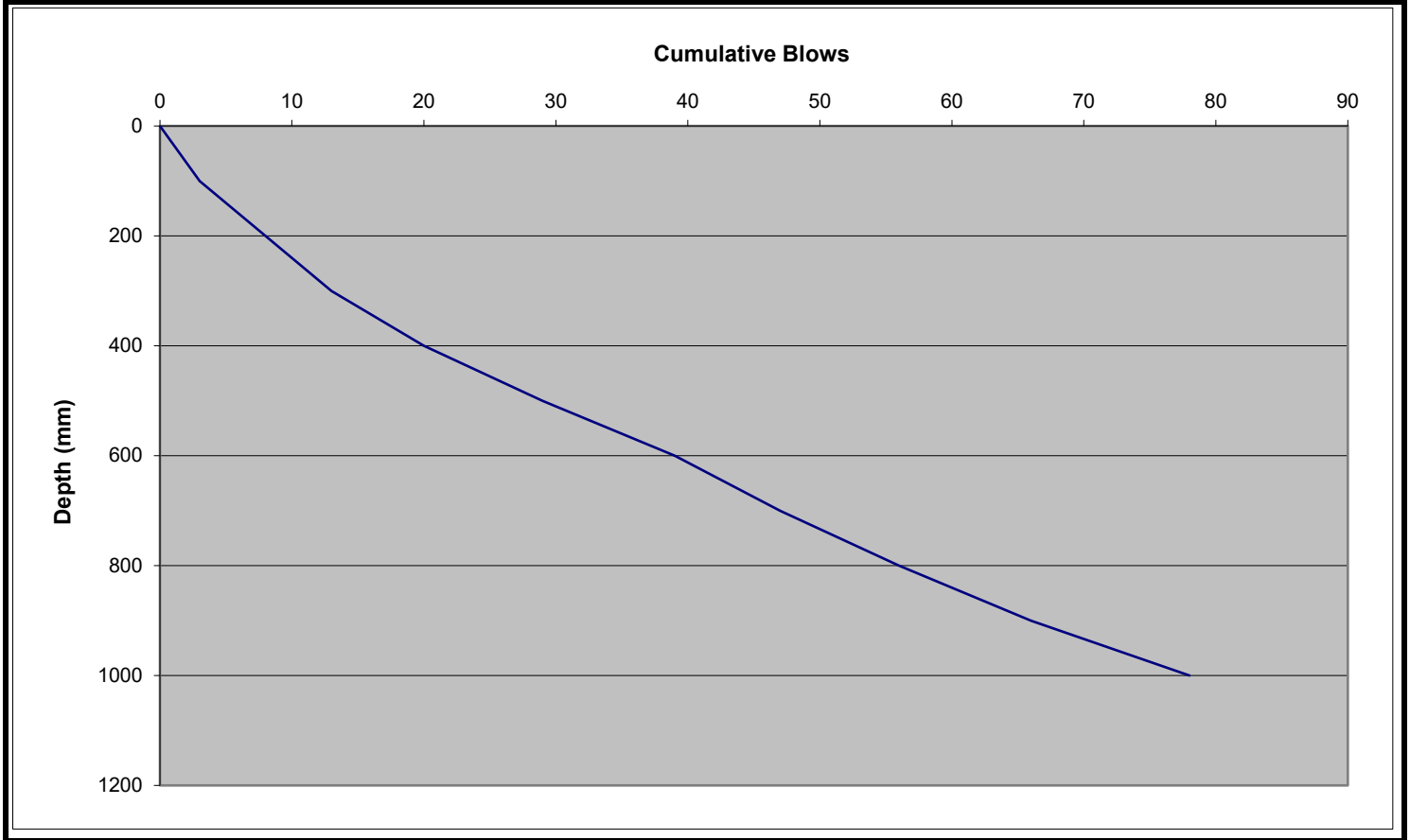
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

DYNAMIC CONE PENETROMETER REPORT

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW	PAGE: 1 OF: 8 ***DCP: 1 (BH1)***
PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **GS23-344**
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT	DATE OF TEST: 19/09/2023
LOCATION: LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW	DEPTH BELOW ESL (mm): 600
SOIL DESCRIPTION: REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG	MOISTURE CONDITION: REFER TO LOGS
DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A	TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	3	5	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	5	9	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	5	9	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	7	14	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	9	20	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	10	23	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	8	17	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8	9	20	2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	10	23	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	12	28	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	END	*	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	*	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



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WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 6/11/2023

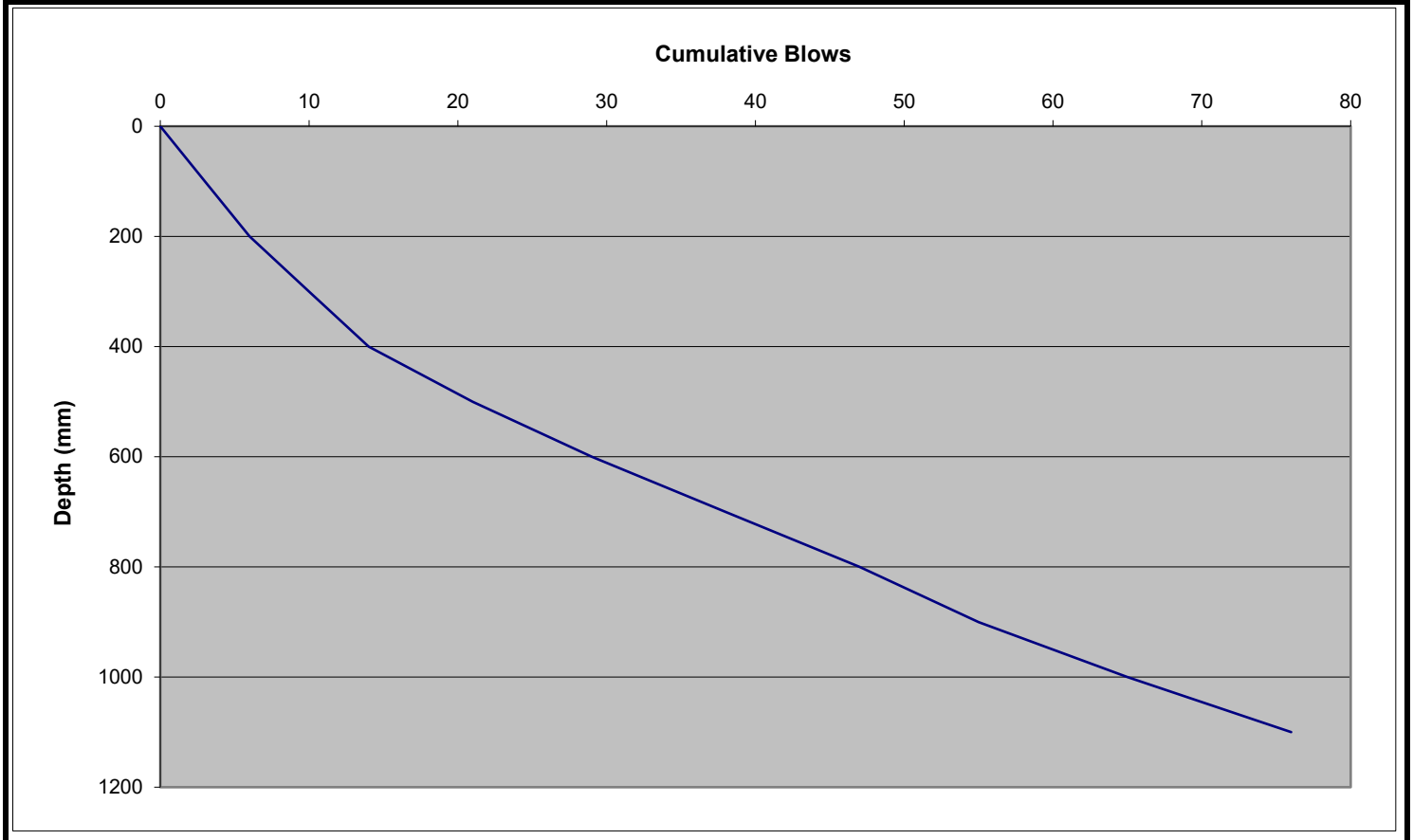
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

DYNAMIC CONE PENETROMETER REPORT

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW	PAGE: 2 OF: 8 ***DCP: 2 (BH2)***
PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **GS23-344**
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT	DATE OF TEST: 21/09/2023
LOCATION: LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW	DEPTH BELOW ESL (mm): 600
SOIL DESCRIPTION: REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG	MOISTURE CONDITION: REFER TO LOGS
DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A	TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	3	5	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	3	5	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	4	7	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	4	7	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	7	14	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	8	17	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	9	20	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8	9	20	2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	8	17	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	10	23	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	11	25	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	END	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



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ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 6/11/2023

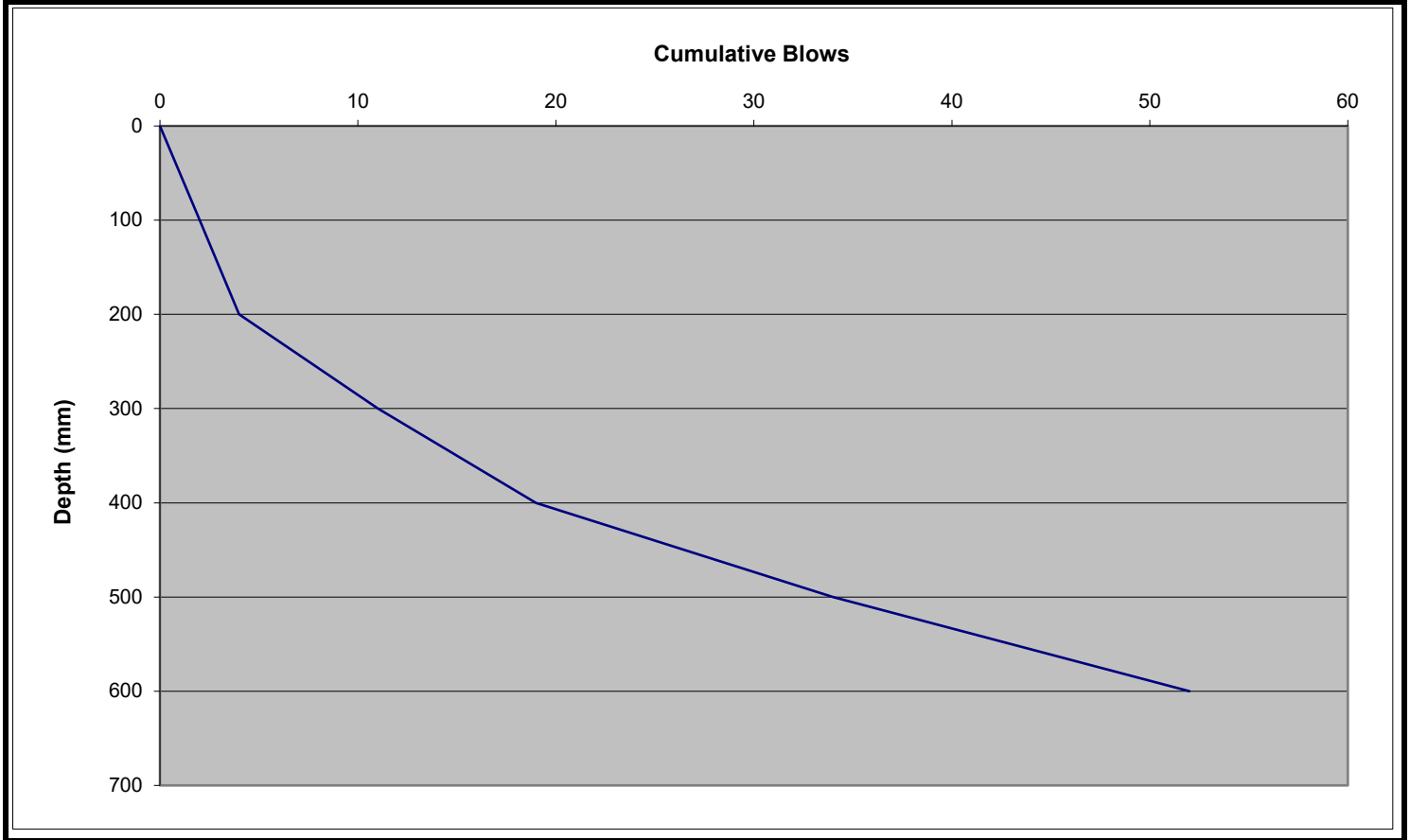
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

DYNAMIC CONE PENETROMETER REPORT

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW	PAGE: 3 OF: 8 ***DCP: 3 (BH3)***
PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **GS23-344**
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT	DATE OF TEST: 19/09/2023
LOCATION: LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW	DEPTH BELOW ESL (mm): 900
SOIL DESCRIPTION: REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG	MOISTURE CONDITION: REFER TO LOGS
DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A	TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	2	3	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	2	3	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	7	14	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	8	17	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	15	38	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	18	48	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	END	*	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8	*	*	2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	*	*	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	*	*	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	*	*	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	*	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



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ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 6/11/2023

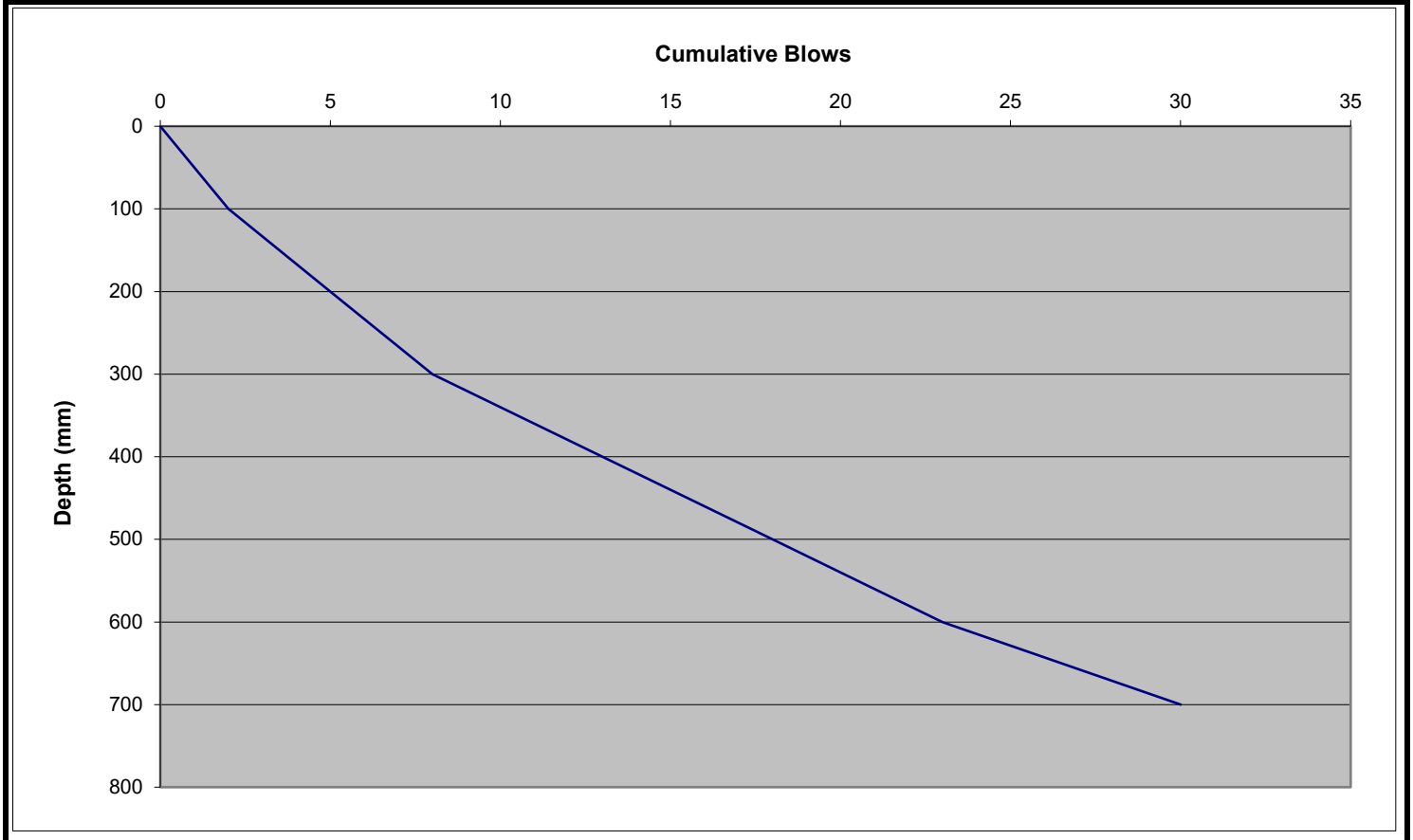
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

DYNAMIC CONE PENETROMETER REPORT

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW	PAGE: 4 OF: 8 ***DCP: 4 (BH4)***
PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **GS23-344**
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT	DATE OF TEST: 19/09/2023
LOCATION: LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW	DEPTH BELOW ESL (mm): 1000
SOIL DESCRIPTION: REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG	MOISTURE CONDITION: REFER TO LOGS
DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A	TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	2	3	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	3	5	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	3	5	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	5	9	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	5	9	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	5	9	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	7	14	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8	END	*	2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	*	*	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	*	*	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	*	*	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	*	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



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ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 6/11/2023

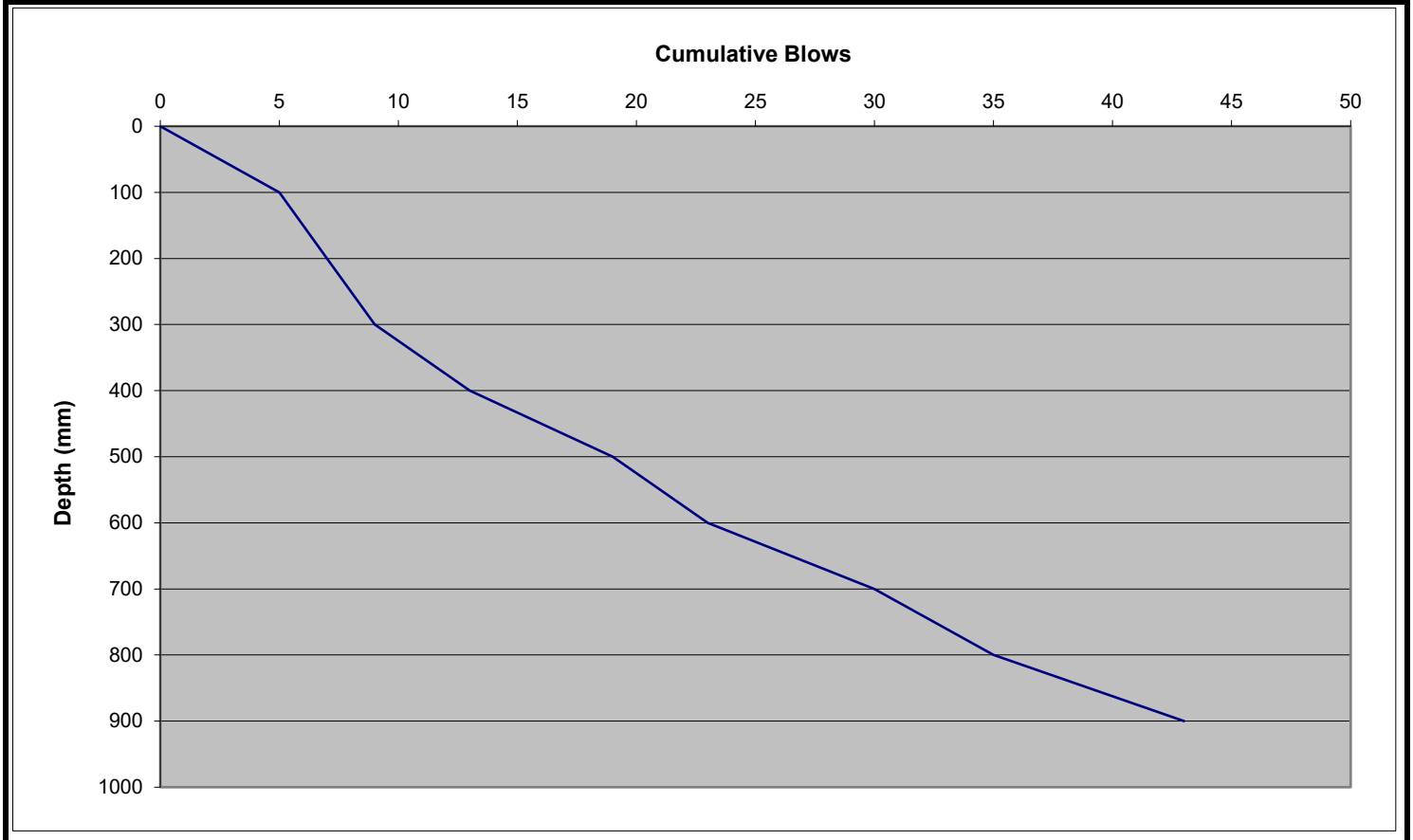
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

DYNAMIC CONE PENETROMETER REPORT

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW	PAGE: 5 OF: 8 ***DCP: 5 (BH5)***
PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **GS23-344**
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT	DATE OF TEST: 21/09/2023
LOCATION: LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW	DEPTH BELOW ESL (mm): 600
SOIL DESCRIPTION: REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG	MOISTURE CONDITION: REFER TO LOGS
DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A	TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	5	9	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	2	3	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	2	3	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	4	7	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	6	12	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	4	7	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	7	14	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8	5	9	2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	8	17	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	END	*	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	*	*	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	*	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



NATA
WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 6/11/2023

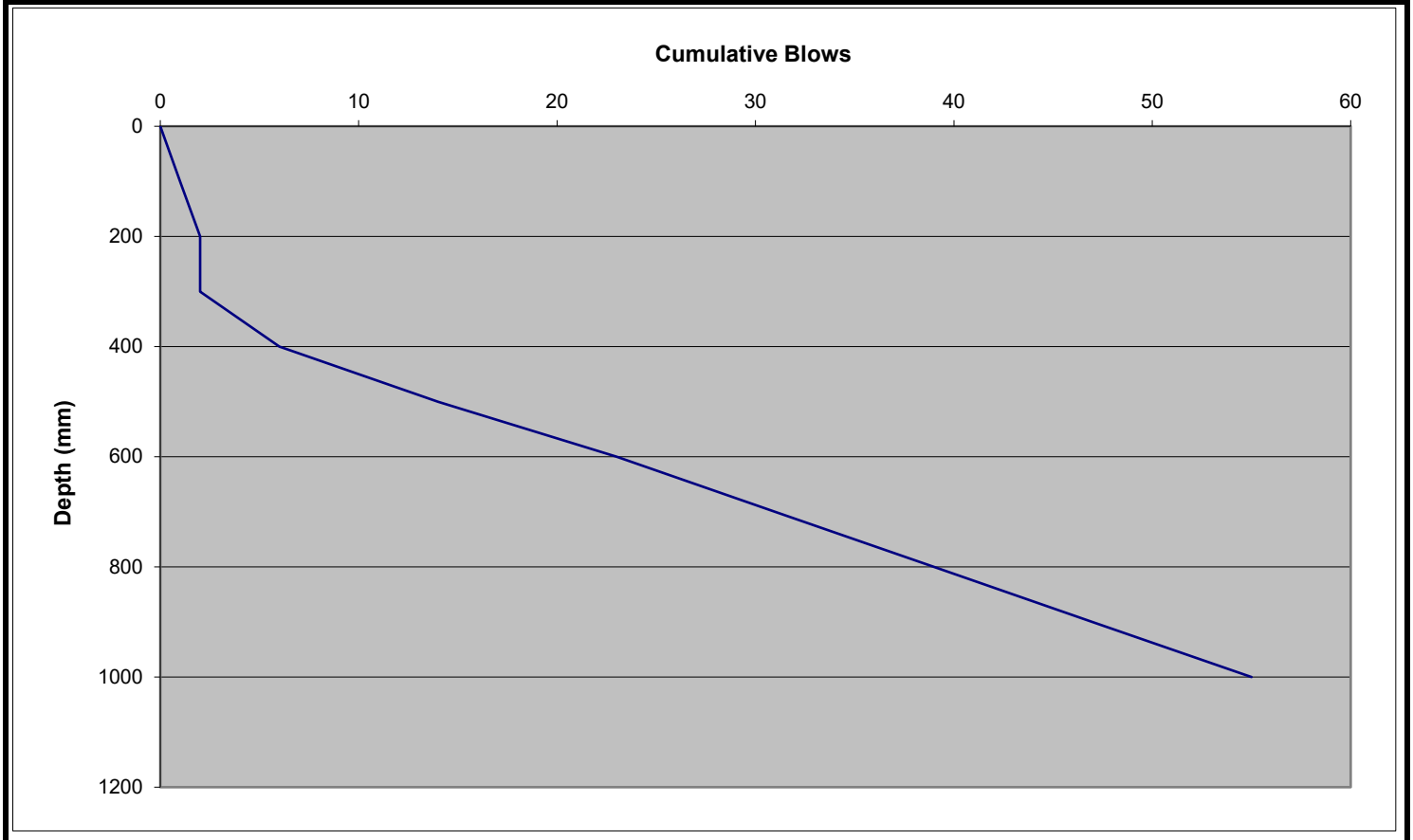
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

DYNAMIC CONE PENETROMETER REPORT

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW	PAGE: 6 OF: 8 ***DCP: 6 (BH6)***
PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **GS23-344**
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT	DATE OF TEST: 21/09/2023
LOCATION: LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW	DEPTH BELOW ESL (mm): 500
SOIL DESCRIPTION: REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG	MOISTURE CONDITION: REFER TO LOGS
DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A	TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	1	1	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	1	1	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3			1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	4	7	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	8	17	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	9	20	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	8	17	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8	8	17	2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	8	17	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	8	17	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	END	*	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	*	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



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WORLD RECOGNISED ACCREDITATION

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ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 6/11/2023

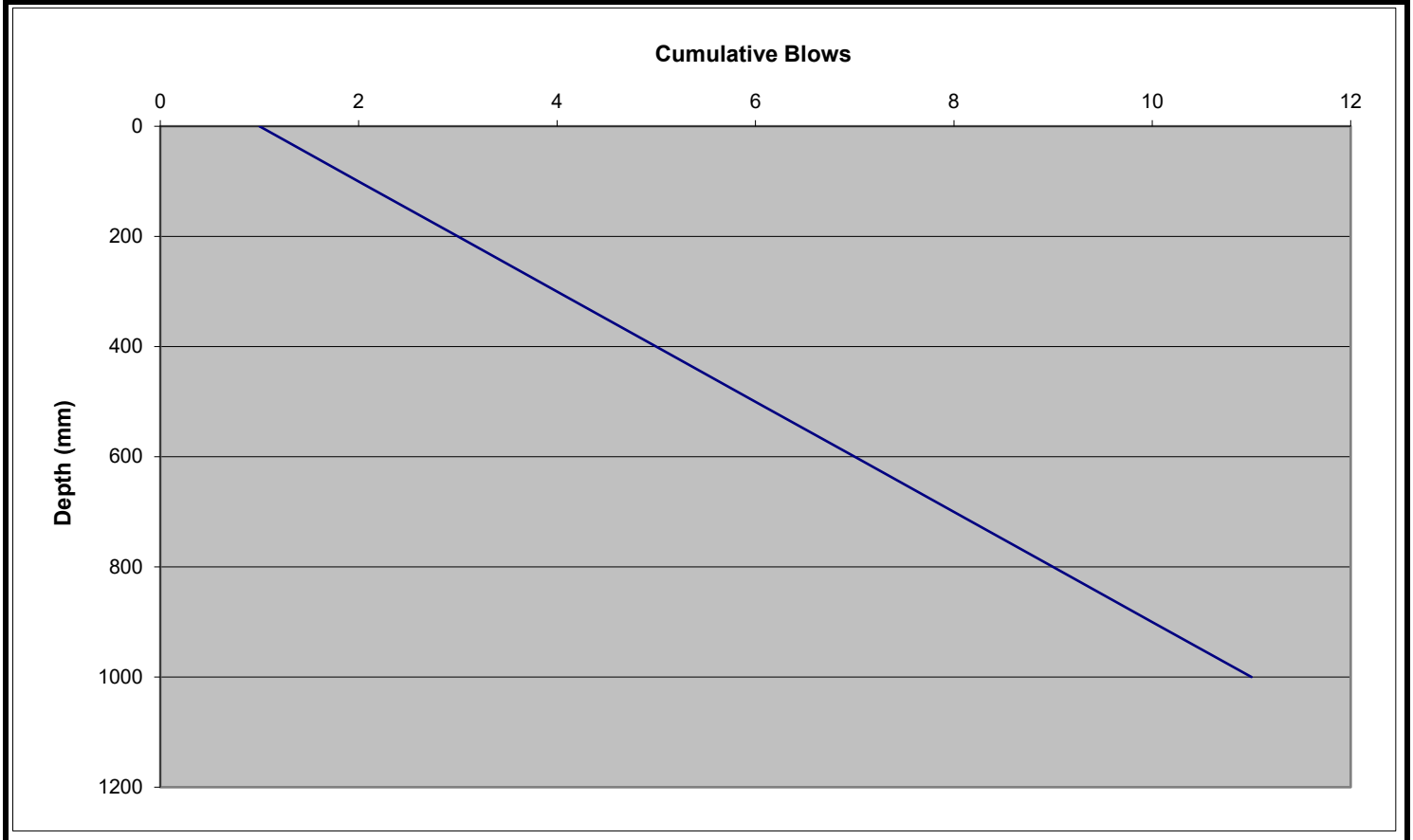
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

DYNAMIC CONE PENETROMETER REPORT

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW	PAGE: 7 OF: 8 ***DCP: 7 (BH7)***
PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **GS23-344**
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT	DATE OF TEST: 21/09/2023
LOCATION: LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW	DEPTH BELOW ESL (mm): 700
SOIL DESCRIPTION: REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG	MOISTURE CONDITION: REFER TO LOGS
DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A	TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	2	3	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	3	5	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	1	1	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	1	1	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	1	1	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6			2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	1	1	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8			2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	1	1	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	7	14	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	END	*	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	*	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



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ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 6/11/2023

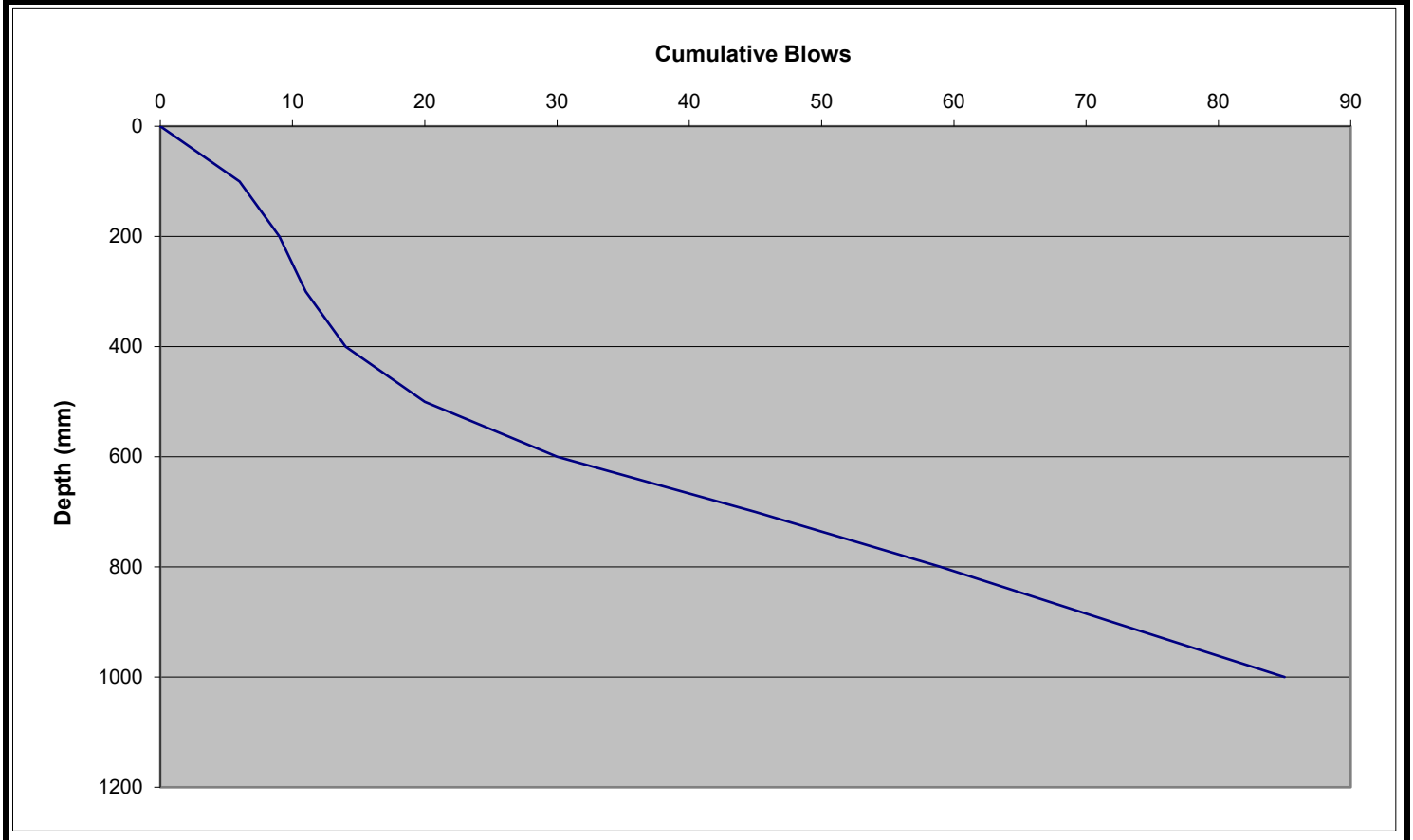
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

DYNAMIC CONE PENETROMETER REPORT

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW	PAGE: 8 OF: 8 ***DCP: 8 (BH8)***
PROJECT: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **GS23-344**
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT	DATE OF TEST: 21/09/2023
LOCATION: LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW	DEPTH BELOW ESL (mm): 500
SOIL DESCRIPTION: REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG	MOISTURE CONDITION: REFER TO LOGS
DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A	TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	6	12	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	3	5	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	2	3	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	3	5	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	6	12	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	10	23	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	15	38	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8	14	35	2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	13	32	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	13	32	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	END	*	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	*	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



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ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 6/11/2023

AITKEN ROWE Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

*

SAMPLED BY: ARTL

DATE SAMPLED: 19 & 21/09/2023

DATE SUBMITTED: 21/09/2023

SAMPLING METHOD: AS1289.1.2.1

SAMPLING CLAUSE: 6.5.3

DATES TESTED: 27/09/23-13/10/23

ORDER No.: *

TEST REPORT: GEOTECHNICAL INVESTIGATION - SOIL ANALYSIS

CLIENT : JOSS CONSTRUCTION - ALBURY, NSW

JOB DESCRIPTION : GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT,
LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW

MATERIAL SOURCE : IN-SITU BOREHOLES | PROPOSED USE : DESIGN

MATERIAL TYPE : REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG

REGISTRATION No : R28 **GS23-344**

		SAMPLE NUMBER :	1B	1E	1F	2C	2E	2F
		SAMPLING LOCATION :	BH1	BH1	BH1	BH2	BH2	BH2
		DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm) :	1200-1400	2900-3350	4500-4950	1500-1700	2300-2600	2700-3000
TESTS	TEST ELEMENT		*	*	*	*	*	*
AS1289.3.6.1		PASS 100.0mm SIEVE %	*	*	*	*	*	*
		PASS 75.0mm SIEVE %	*	*	*	*	*	*
		PASS 53.0mm SIEVE %	*	*	*	*	*	*
		PASS 37.5mm SIEVE %	*	*	*	*	*	*
		PASS 26.5mm SIEVE %	*	*	*	*	*	*
		PASS 19.0mm SIEVE %	*	*	*	*	*	*
		PASS 13.2mm SIEVE %	*	*	*	*	*	*
		PASS 9.50mm SIEVE %	*	*	*	*	*	*
		PASS 6.70mm SIEVE %	*	*	*	*	*	*
		PASS 4.75mm SIEVE %	*	*	*	*	*	*
		PASS 2.36mm SIEVE %	*	*	*	*	*	*
AS1141.19	WHOLE SAMPLE	PASS 425 µm SIEVE %	*	*	*	*	*	*
		PASS 75 µm SIEVE %	*	*	*	*	*	*
		LESS THAN 13.5 µm %	*	*	*	*	*	*
AS1141.19	-2.36mm	PASS 425 µm SIEVE %	*	*	*	*	*	*
		PASS 75 µm SIEVE %	*	*	*	*	*	*
		LESS THAN 13.5 µm %	*	*	*	*	*	*
		OBSERVATIONS	*	*	*	*	*	*
AS1289.3.1.2		LIQUID LIMIT %	*	*	*	*	*	*
AS1289.3.2.1		PLASTIC LIMIT %	*	*	*	*	*	*
AS1289.3.3.1		PLASTICITY INDEX	*	*	*	*	*	*
		PREPARATION METHOD	*	*	*	*	*	*
AS1289.5.1.1		STANDARD MAX. DRY DENSITY t/m^3	*	*	*	*	*	*
(NOT DRY PREPPED)		OPTIMUM MOISTURE CONTENT %	*	*	*	*	*	*
		OVERSIZE MATERIAL % RETAINED ON 19.0mm	*	*	*	*	*	*
		LL METHOD OF CURING TIME DETERMINATION	*	*	*	*	*	*
		CURING DURATION HOURS	*	*	*	*	*	*
AS1289.3.4.1		LINEAR SHRINKAGE %	13.0	3.0	7.0	10.5	5.0	4.0
(PREP-AIR DRIED)		LENGTH OF MOULD mm	250	250	250	250	250	250
		MOULDING MOISTURE CONDITIONING METHOD	AS1289.3.1.2	AS1289.3.1.2	AS1289.3.1.2	AS1289.3.1.2	AS1289.3.1.2	AS1289.3.1.2
		CRUMBLING (CR) OR CURLING (CU) OCCURRED	CA	CA	CA	CA	CA	CA
AS1289.2.1.1		FIELD MOISTURE CONTENT %	26.2	*	*	14.8	17.9	*

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ACCREDITATION NUMBER: 4679

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All samples are oven dried and dry sieved during prep. unless otherwise stated

APPROVED SIGNATORY : .....

Jarrod Gornall

DATE: 6/11/2023

AITKEN ROWE Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

*

SAMPLED BY: ARTL

DATE SAMPLED: 19 & 21/09/2023

DATE SUBMITTED: 21/09/2023

SAMPLING METHOD: AS1289.1.2.1

SAMPLING CLAUSE: 6.5.3

DATES TESTED: 27/09/23-13/10/23

ORDER No.: *

TEST REPORT: GEOTECHNICAL INVESTIGATION - SOIL ANALYSIS

CLIENT : JOSS CONSTRUCTION - ALBURY, NSW

JOB DESCRIPTION : GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT,
LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW

MATERIAL SOURCE : IN-SITU BOREHOLES | PROPOSED USE : DESIGN

MATERIAL TYPE : REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG

REGISTRATION No : R28 **GS23-344**

		SAMPLE NUMBER :	2H	3B	3C	3E	3G	4E
		SAMPLING LOCATION :	BH2	BH3	BH3	BH3	BH3	BH4
		DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm) :	4500-1950	1300-1500	1500-1950	3000-3450	4500-4950	1800-1950
TESTS	TEST ELEMENT		*	*	*	*	*	*
AS1289.3.6.1		PASS 100.0mm SIEVE %	*	*	*	*	*	*
		PASS 75.0mm SIEVE %	*	*	*	*	*	*
		PASS 53.0mm SIEVE %	*	*	*	*	*	*
		PASS 37.5mm SIEVE %	*	*	*	*	*	*
		PASS 26.5mm SIEVE %	*	*	*	*	*	*
		PASS 19.0mm SIEVE %	*	*	*	*	*	*
		PASS 13.2mm SIEVE %	*	*	*	*	*	*
		PASS 9.50mm SIEVE %	*	*	*	*	*	*
		PASS 6.70mm SIEVE %	*	*	*	*	*	*
		PASS 4.75mm SIEVE %	*	*	*	*	*	*
		PASS 2.36mm SIEVE %	*	*	100	*	*	*
AS1141.19	WHOLE SAMPLE	PASS 425 µm SIEVE %	*	*	89	*	*	*
		PASS 75 µm SIEVE %	*	*	59	*	*	*
		LESS THAN 13.5 µm %	*	*	36	*	*	*
AS1141.19	-2.36mm	PASS 425 µm SIEVE %	*	*	89	*	*	*
		PASS 75 µm SIEVE %	*	*	59	*	*	*
		LESS THAN 13.5 µm %	*	*	36	*	*	*
		OBSERVATIONS	*	*	*	*	*	*
AS1289.3.1.2		LIQUID LIMIT %	*	*	39	*	*	*
AS1289.3.2.1		PLASTIC LIMIT %	*	*	16	*	*	*
AS1289.3.3.1		PLASTICITY INDEX	*	*	23	*	*	*
		PREPARATION METHOD	*	*	AS1289.1.1-5.3	*	*	*
AS1289.5.1.1		STANDARD MAX. DRY DENSITY t/m^3	*	*	*	*	*	*
(NOT DRY PREPPED)		OPTIMUM MOISTURE CONTENT %	*	*	*	*	*	*
		OVERSIZE MATERIAL % RETAINED ON 19.0mm	*	*	*	*	*	*
		LL METHOD OF CURING TIME DETERMINATION	*	*	*	*	*	*
		CURING DURATION HOURS	*	*	*	*	*	*
AS1289.3.4.1		LINEAR SHRINKAGE %	8.0	9.5	*	1.5	9.5	10.0
(PREP-AIR DRIED)		LENGTH OF MOULD mm	250	250	*	250	250	250
		MOULDING MOISTURE CONDITIONING METHOD	AS1289.3.1.2	AS1289.3.1.2	*	AS1289.3.1.2	AS1289.3.1.2	AS1289.3.1.2
		CRUMBLING (CR) OR CURLING (CU) OCCURRED	CA	CA	*	CA	CA	CA
AS1289.2.1.1		FIELD MOISTURE CONTENT %	*	*	25.8	18.1	*	*

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WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

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APPROVED SIGNATORY : ..... DATE: 6/11/2023

Jarrod Gornall

AITKEN ROWE Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

*

SAMPLED BY: ARTL

DATE SAMPLED: 19 & 21/09/2023

DATE SUBMITTED: 21/09/2023

SAMPLING METHOD: AS1289.1.2.1

SAMPLING CLAUSE: 6.5.3

DATES TESTED: 27/09/23-13/10/23

ORDER No.: *

TEST REPORT: GEOTECHNICAL INVESTIGATION - SOIL ANALYSIS

CLIENT : JOSS CONSTRUCTION - ALBURY, NSW

JOB DESCRIPTION : GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN
PROPOSED MULTI-STORY RESIDENTIAL DEVELOPMENT,
LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW

MATERIAL SOURCE : IN-SITU BOREHOLES | PROPOSED USE : DESIGN

MATERIAL TYPE : REFER TO BOREHOLE LOGS & MATERIALS SCHEDULE & LOG

REGISTRATION No : R28 **GS23-344**

		SAMPLE NUMBER :	4F	F5	SG5A	F8	SG8B	*
		SAMPLING LOCATION :	BH4	BH5	BH5	BH8	BH8	*
		DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm) :	2300-2500	0-100	900-1300	300-550	900-1300	*
TESTS	TEST ELEMENT		*	*	*	*	*	*
AS1289.3.6.1		PASS 100.0mm SIEVE %	*	*	*	*	*	*
		PASS 75.0mm SIEVE %	*	*	*	*	*	*
		PASS 53.0mm SIEVE %	*	*	*	*	*	*
		PASS 37.5mm SIEVE %	*	*	*	*	*	*
		PASS 26.5mm SIEVE %	*	100	*	*	*	*
		PASS 19.0mm SIEVE %	*	99	*	100	*	*
		PASS 13.2mm SIEVE %	*	98	*	94	*	*
		PASS 9.50mm SIEVE %	*	97	*	90	*	*
		PASS 6.70mm SIEVE %	*	90	*	86	*	*
		PASS 4.75mm SIEVE %	*	84	*	84	*	*
		PASS 2.36mm SIEVE %	*	71	100	80	100	*
AS1141.19	WHOLE SAMPLE	PASS 425 µm SIEVE %	*	42	88	71	95	*
		PASS 75 µm SIEVE %	*	26	62	51	72	*
		LESS THAN 13.5 µm %	*	17	51	35	55	*
AS1141.19	-2.36mm	PASS 425 µm SIEVE %	*	59	88	89	95	*
		PASS 75 µm SIEVE %	*	36	62	64	72	*
		LESS THAN 13.5 µm %	*	24	51	44	55	*
		OBSERVATIONS	*	*	*	*	*	*
AS1289.3.1.2		LIQUID LIMIT %	*	27	44	38	44	*
AS1289.3.2.1		PLASTIC LIMIT %	*	18	14	15	14	*
AS1289.3.3.1		PLASTICITY INDEX	*	9	30	23	30	*
		PREPARATION METHOD	*	AS1289.1.1-5.3	AS1289.1.1-5.3	AS1289.1.1-5.3	AS1289.1.1-5.3	*
AS1289.5.1.1		STANDARD MAX. DRY DENSITY t/m^3	*	*	1.57	*	1.57	*
(NOT DRY PREPPED)		OPTIMUM MOISTURE CONTENT %	*	*	24.6	*	24.4	*
		OVERSIZE MATERIAL % RETAINED ON 19.0mm	*	*	0	*	0	*
		LL METHOD OF CURING TIME DETERMINATION	*	*	VISUAL	*	VISUAL	*
		CURING DURATION HOURS	*	*	171	*	171	*
AS1289.3.4.1		LINEAR SHRINKAGE %	7.5	*	*	*	*	*
(PREP-AIR DRIED)		LENGTH OF MOULD mm	250	*	*	*	*	*
		MOULDING MOISTURE CONDITIONING METHOD	AS1289.3.1.2	*	*	*	*	*
		CRUMBLING (CR) OR CURLING (CU) OCCURRED	CA	*	*	*	*	*
AS1289.2.1.1		FIELD MOISTURE CONTENT %	*	3.4	25.4	18.6	26.8	*

NATA
WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

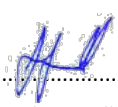
*

*

*

All samples are oven dried and dry sieved during prep. unless otherwise stated

APPROVED SIGNATORY : .....



Jarrod Gornall

DATE: 6/11/2023

AITKEN ROWE Testing Laboratories Pty Ltd

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

TEST REPORT

CALIFORNIA BEARING RATIO OF SOILS AND GRAVELS

CLIENT: JOSS CONSTRUCTION - ALBURY, NSW

JOB DESCRIPTION: GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN
PROPOSED MULTI-STOREY RESIDENTIAL DEVELOPMENT,
LOT 1, No. 65-67 RAILWAY STREET, GRIFFITH, NSW

SOURCE OF MATERIAL: IN-SITU BOREHOLES

PROPOSED USE: DESIGN

SAMPLED BY: ARTL

DATE SAMPLED: 19&21/09/2023

DATE RECEIVED: 21/09/2023

TESTING COMMENCED: 27/09/2023

TESTING COMPLETED: 17/10/2023

TEST METHODS: AS1289.2.1.1
AS1289.5.1.1 AS1289.6.1.1

SAMPLING PROCEDURE: AS1289.1.2.1

SAMPLING CLAUSE: 6.5.3

LOT NO: * ORDER NO: *

REGISTRATION NO : R6 **GS23-344**

SAMPLE NO:	SG5A	SG8B	*	*	*
SITE OR LOCATION	BH5	BH8	*	*	*
DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm)	900-1300	900-1300	*	*	*
ADDITIVE IF STABILISED	N/A	N/A	*	*	*
AMOUNT OF ADDITIVE (%)	N/A	N/A	*	*	*
TYPE OF COMPACTION (Standard/Modified)	STANDARD	STANDARD	*	*	*
MATERIAL RETAINED ON THE 19.0mm SIEVE (%)	0.0	0.0	*	*	*
OPTIMUM MOISTURE CONTENT (%)	24.6	24.4	*	*	*
MAXIMUM DRY DENSITY (t/m^3)	1.57	1.57	*	*	*
MOULDING MOISTURE CONTENT (%)	24.7	24.2	*	*	*
DRY DENSITY OF TEST SPECIMEN (t/m^3)	1.49	1.49	*	*	*
SPECIFIED LDR (%)	95	95	*	*	*
ACTUAL LDR (%)	95	95	*	*	*
MOISTURE CONTENTS : TOP 30 mm	30.3	30.4	*	*	*
WHOLE SAMPLE	28.3	27.7	*	*	*
ABSORPTION (%)	3.7	3.5	*	*	*
SPECIFIED LMR (%)	100	100	*	*	*
ACTUAL LMR (%)	100	99	*	*	*
NUMBER OF DAYS SOAKING	10	10	*	*	*
SWELL (%)	0.6	1.0	*	*	*
CBR OBTAINED FROM PENETRATION (mm)	2.5	2.5	*	*	*
CALIFORNIA BEARING RATIO (%)	**4**	**4**	*	*	*

NOTES: *
*

COMMENTS: *

NATA
WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 6/11/2023

AITKEN ROWE TESTING LABORATORIES PTY LTD

DESIGN TRAFFIC CALCULATION

Reg. No.: **GS23-344**

Project: **Geotechnical Investigation & Pavement Design - Proposed Multi-Story Residential Development, Lot 1, No. 65-67 Railway Street, Griffith, NSW**

1. AADT:	120
2. HV%:	5.0
3. Direction Factor (DF):	0.5
4. Lane Distribution Factor (LDF):	1.0
5. Design Life (Years)	20
6. Growth Rate:	2.0%
7. Cumulative Growth Factor (CGF)	24.30
8. Average number of axle groups per Heavy Vehicle (Nhvag):	2.8
9. ESA/HVAG:	0.267
10. Use of Design Lane %	100.0

Ni=AADTxDFx%HV/100xLDF

Ni=Initial Daily Heavy Vehicles trasversing the design lane

Ni= 3 HVs

Nhv=365xCGFxNi

Nhv= Cumulative number of Heavy Vehicles trasversing the design lane during design period

Nhv= 2.66E+04 HVs

Ndt=NhvxNhvag

Ndt=Cumulative number of heavy vehicle axle groups in the design lane during design period

Ndt= 7.45E+04 HVAGs

DESA=(ESA/HVAG)*Ndt

DESA=Design number of Equivalent Standard Axles of traffic loading

DESA= 1.99E+04

CIRCLY - Version 7.0 (24 August 2023)

Job Title: GS23-344 Geotechncial Investigation & Pavement Design - Proposed Multi-Story Development, Lot 1, No. 65-67 Railway Street, Griffith, NSW

Design Method: Austroads 2017

NDT (cumulative heavy vehicle axle groups over design period): 7.45E+04

Traffic Load Distribution:

ID: LTR - O5
Name: Lightly-Trafficked Roads - O5 - local access with no buses
ESA/HVAG: 0.267

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA750-Full	ESA750-Full	Vertical Force	92.1	0.75	0.00
2	SAST53	SAST53	Vertical Force	102.4	0.80	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA750-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA750-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA750-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA750-Full	1	1965.0	0.0	1.00E+00	0.00
1	SAST53	1	0.0	0.0	1.00E+00	0.00
2	SAST53	1	2130.0	0.0	1.00E+00	0.00

Details of Layered System:

ID: GS23-344 Title: Proposed Car Park and Pavements, Lot 1, No. 65-67 Railway Street

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_350	Aniso.	3.50E+02	0.35	2.59E+02	1.75E+02	0.35
2	rough	Gran_200	Aniso.	2.00E+02	0.35	1.48E+02	1.00E+02	0.35
3	rough	Sub_CBR4	Aniso.	4.00E+01	0.45	2.76E+01	2.00E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Shift Factor
3	top	Sub_CBR4	EZZ	0.009150	7.000	

Reliability Factors:
Project Reliability: Austroads 95%

Layer No.	Reliability Factor	Material Type
3	1.00	Subgrade (Austroads 2017)

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering

Strains:

Layer No.	Thickness	Material ID	Axle	Unitless Strain
3	0.00	Sub_CBR4		
			SADT(80):	2.219E-03

Results:

Layer No.	Thickness	Material ID	Axle Group	CDF
1	100.00	Gran_350		n/a
2	210.00	Gran_200		n/a
3	0.00	Sub_CBR4	Total:	9.820E-01

CIRCLY - Version 7.0 (24 August 2023)

Job Title: GS23-344 Geotechncial Investigation & Pavement Design - Proposed Multi-Story Development, Lot 1, No. 65-67 Railway Street, Griffith, NSW

Design Method: Austroads 2017

NDT (cumulative heavy vehicle axle groups over design period): 7.45E+04

Traffic Load Distribution:

ID: LTR - O5
Name: Lightly-Trafficked Roads - O5 - local access with no buses
ESA/HVAG: 0.267

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA750-Full	ESA750-Full	Vertical Force	92.1	0.75	0.00
2	SAST53	SAST53	Vertical Force	102.4	0.80	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA750-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA750-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA750-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA750-Full	1	1965.0	0.0	1.00E+00	0.00
1	SAST53	1	0.0	0.0	1.00E+00	0.00
2	SAST53	1	2130.0	0.0	1.00E+00	0.00

Details of Layered System:

ID: GS23-344 Title: Proposed Car Park and Pavements, Lot 1, No. 65-67 Railway Street

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_200	Aniso.	2.00E+02	0.35	1.48E+02	1.00E+02	0.35
2	rough	Gran_200	Aniso.	2.00E+02	0.35	1.48E+02	1.00E+02	0.35
3	rough	Sub_CBR4	Aniso.	4.00E+01	0.45	2.76E+01	2.00E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Shift Factor
3	top	Sub_CBR4	EZZ	0.009150	7.000	

Reliability Factors:
Project Reliability: Austroads 95%

Layer No.	Reliability Factor	Material Type
3	1.00	Subgrade (Austroads 2017)

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering

Strains:

Layer No.	Thickness	Material ID	Axle	Unitless Strain
3	0.00	Sub_CBR4		
			SADT(80):	2.202E-03

Results:

Layer No.	Thickness	Material ID	Axle Group	CDF
1	110.00	Gran_200		n/a
2	205.00	Gran_200		n/a
3	0.00	Sub_CBR4	Total:	9.286E-01

CIRCLY - Version 7.0 (24 August 2023)

Job Title: GS23-344 Geotechncial Investigation & Pavement Design - Proposed Multi-Story Development, Lot 1, No. 65-67 Railway Street, Griffith, NSW

Design Method: Austroads 2017

NDT (cumulative heavy vehicle axle groups over design period): 7.45E+04

Traffic Load Distribution:

ID: LTR - O5
Name: Lightly-Trafficked Roads - O5 - local access with no buses
ESA/HVAG: 0.267

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA750-Full	ESA750-Full	Vertical Force	92.1	0.75	0.00
2	SAST53	SAST53	Vertical Force	102.4	0.80	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA750-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA750-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA750-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA750-Full	1	1965.0	0.0	1.00E+00	0.00
1	SAST53	1	0.0	0.0	1.00E+00	0.00
2	SAST53	1	2130.0	0.0	1.00E+00	0.00

Details of Layered System:

ID: GS23-344 Title: Proposed Car Park and Pavements, Lot 1, No. 65-67 Railway Street

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_350	Aniso.	3.50E+02	0.35	2.59E+02	1.75E+02	0.35
2	rough	subsltCB10	Aniso.	1.00E+02	0.45	6.90E+01	5.00E+01	0.45
3	rough	Sub_CBR4	Aniso.	4.00E+01	0.45	2.76E+01	2.00E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Shift Factor
2	top	subsltCB10	EZZ	0.009150	7.000	
3	top	Sub_CBR4	EZZ	0.009150	7.000	

Reliability Factors:
Project Reliability: Austroads 95%

Layer No.	Reliability Factor	Material Type
2	1.00	Subgrade (Selected Material) (Austroads 2017)
3	1.00	Subgrade (Austroads 2017)

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering

Strains:

Layer No.	Thickness	Material ID	Axle	Unitless Strain
2	250.00	subsltCB10		
			SADT(80):	2.174E-03
3	0.00	Sub_CBR4		
			SADT(80):	1.554E-03

Results:

Layer No.	Thickness	Material ID	Axle Group	CDF
1	175.00	Gran_350		n/a
2	250.00	subsltCB10	Total:	8.508E-01
3	0.00	Sub_CBR4	Total:	8.109E-02

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road
Thornleigh NSW 2120
Mailing Address: PO Box 357
Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 66165	Sample N°: 1	Date Received: 3/10/23	Report Status: Final

Client Name:	**Aitken Rowe Testing Laboratories (ARTL) Pty Ltd**	Project Name:	**Proposed Multi storey Development - Lot 1 / 65-67, Railway St**
Client Contact:	**Reports**	SESL Quote N°:	
Client Order N°:		Sample Name:	**GS23 - 344 / 3F**
Address:	**PO Box 5158** **WAGGA WAGGA NSW 2650**	Description:	**Soil**
		Test Type:	**ARTL**

TEST	RESULT	COMMENTS
pH in water (1:5)	8.7	Strong alkalinity
EC mS/cm (1:5)	0.24	Slight
Texture Class	-	Did not test
Soil Condition Class (Permeability)	-	Did not test
SOLUBLE ANION ANALYSIS		
Sulphate (1:5) $mgSO_4$ / kg	110	Low (non to mildly aggressive)
Chloride (1:5) mgCl / kg	480	Low (non-aggressive)
* Resistivity Ω. m	7.1	Low (moderately to severely aggressive)

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

Analysed by SESL Australia Pty Ltd (NATA # 15633).

For the purposes of this corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows strong alkaline pH, slight salinity, low sulphate, low chloride and low resistivity.

According to the *Australian Standard (AS) 2159-2009: Piling - Design and Installation*, the pH is considered non-aggressive to mildly aggressive towards concrete (dependent on soil permeability) and non-aggressive towards steel. The sulfate levels are considered to be non-aggressive to mildly aggressive towards concrete, and the chloride levels are considered to be non-aggressive towards steel. Resistivity is considered to be moderately aggressive to severely aggressive towards steel.

Factors affecting concrete scaling are: (a) elevated sulfate, becoming mildly aggressive at >2400 $mgSO_4$/kg; and (b) low pH, becoming moderately aggressive at pH of <5-6.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000 mgCl/kg; and (b) low pH, becoming mildly aggressive at pH of <4-5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, according AS2159:2009 the likelihood of aggressive corrosion is mild based on the low sulphate and chloride and moderate to severe based on the low resistivity. SESL recommends further assessment on the physical properties of the soil

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
11/10/2023

Consultant:
Samuel Field

Authorised Signatory:
Samantha Grant-Vest

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 66165	Sample N°: 2	Date Received: 3/10/23	Report Status: Final

Client Name:	**Aitken Rowe Testing Laboratories (ARTL) Pty Ltd**	Project Name:	**Proposed Multi storey Development - Lot 1 / 65-67, Railway St**
Client Contact:	**Reports**	SESL Quote N°:	
Client Order N°:		Sample Name:	**GS23 - 344 / 4J**
Address:	**PO Box 5158 WAGGA WAGGA NSW 2650**	Description:	**Soil**
		Test Type:	**ARTL**

TEST		RESULT	COMMENTS
pH in water (1:5)		8.8	Strong alkalinity
EC mS/cm (1:5)		0.11	Low
Texture Class		-	Did not test
Soil Condition Class (Permeability)		-	Did not test
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	$mgSO_4$ / kg	20	Low (non to mildly aggressive)
Chloride (1:5)	mgCl / kg	390	Low (non-aggressive)
* Resistivity Ω. m		8.9	Low (moderately to severely aggressive)

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

Analysed by SESL Australia Pty Ltd (NATA # 15633).

For the purposes of this corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows strong alkaline pH, low salinity, low sulphate, low chloride and low resistivity.

According to the *Australian Standard (AS) 2159-2009: Piling - Design and Installation*, the pH is considered non-aggressive to mildly aggressive towards concrete (dependent on soil permeability) and non-aggressive towards steel. The sulfate levels are considered to be non-aggressive to mildly aggressive towards concrete, and the chloride levels are considered to be non-aggressive towards steel. Resistivity is considered to be moderately aggressive to severely aggressive towards steel.

Factors affecting concrete scaling are: (a) elevated sulfate, becoming mildly aggressive at >2400 $mgSO_4$/kg; and (b) low pH, becoming moderately aggressive at pH of <5-6.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000 mgCl/kg; and (b) low pH, becoming mildly aggressive at pH of <4-5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, according AS2159:2009 the likelihood of aggressive corrosion is mild based on the low sulphate and chloride and moderate to severe based on the low resistivity. SESL recommends further assessment on the physical properties of the soil

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
11/10/2023

Consultant:
Samuel Field

Authorised Signatory:
Samantha Grant-Vest

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 334173

Client Details

Client	Aitken Rowe Testing Laboratories (Griffith)Pty Ltd
Attention	Peter Forbes-Taber
Address	17B Battista St, GRIFFITH, NSW, 2680

Sample Details

Your Reference	**GS23-344, Lot 1, 65-67 Railway St Griffith NSW**
Number of Samples	18 Soil
Date samples received	28/09/2023
Date completed instructions received	28/09/2023

Analysis Details

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

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

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

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	06/10/2023
Date of Issue	06/10/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Inorganics Supervisor
Liam Timmins, Organics Supervisor
Loren Bardwell, Development Chemist
Tim Toll, Chemist (FAS)

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		334173-1	334173-2	334173-3	334173-4	334173-5
Your Reference	UNITS	GS23-344/1A	GS23-344/1B	GS23-344/2A	GS23-344/2B	GS23-344/3A
Depth		0.7-0.9m	2.1-2.3m	0.3-0.5m	0.5-0.7m	0.1-0.2m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	82	68	67	66	78

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		334173-6	334173-7	334173-8	334173-9	334173-10
Your Reference	UNITS	GS23-344/3B	GS23-344/4A	GS23-344/4B	GS23-344/5A	GS23-344/5B
Depth		2.1-2.3m	0.2-0.35m	1.05-1.25m	0.3-0.35m	0.75-0.80m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	62	73	74	72	73

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		334173-11	334173-12	334173-13	334173-14	334173-15
Your Reference	UNITS	GS23-344/F6A	GS23-344/6A	GS23-344/7A	GS23-344/7B	GS23-344/8A
Depth		0.3-0.35m	0.5-0.55m	0.4-0.45m	0.95-1.0m	0.05-0.1m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	65	60	66	65	78

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		334173-16	334173-17	334173-18
Your Reference	UNITS	GS23-344/8B	GS23-344/9A	GS23-344/9B
Depth		0.5-0.55m	0.05-0.1m	0.4-0.45m
Date Sampled		21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	67	79	70

svTRH (C10-C40) in Soil						
Our Reference		334173-1	334173-2	334173-3	334173-4	334173-5
Your Reference	UNITS	GS23-344/1A	GS23-344/1B	GS23-344/2A	GS23-344/2B	GS23-344/3A
Depth		0.7-0.9m	2.1-2.3m	0.3-0.5m	0.5-0.7m	0.1-0.2m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	30/09/2023	30/09/2023	30/09/2023	30/09/2023	30/09/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	110
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	110
Surrogate o-Terphenyl	%	86	85	88	88	95

svTRH (C10-C40) in Soil						
Our Reference		334173-6	334173-7	334173-8	334173-9	334173-10
Your Reference	UNITS	GS23-344/3B	GS23-344/4A	GS23-344/4B	GS23-344/5A	GS23-344/5B
Depth		2.1-2.3m	0.2-0.35m	1.05-1.25m	0.3-0.35m	0.75-0.80m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	30/09/2023	30/09/2023	30/09/2023	30/09/2023	30/09/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	86	88	88	86	86

svTRH (C10-C40) in Soil						
Our Reference		334173-11	334173-12	334173-13	334173-14	334173-15
Your Reference	UNITS	GS23-344/F6A	GS23-344/6A	GS23-344/7A	GS23-344/7B	GS23-344/8A
Depth		0.3-0.35m	0.5-0.55m	0.4-0.45m	0.95-1.0m	0.05-0.1m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	30/09/2023	30/09/2023	30/09/2023	30/09/2023	30/09/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	120	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	110
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	120	110
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	160	120
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	140
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	160	250
Surrogate o-Terphenyl	%	86	86	85	87	88

svTRH (C10-C40) in Soil				
Our Reference		334173-16	334173-17	334173-18
Your Reference	UNITS	GS23-344/8B	GS23-344/9A	GS23-344/9B
Depth		0.5-0.55m	0.05-0.1m	0.4-0.45m
Date Sampled		21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	30/09/2023	30/09/2023	30/09/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50
Surrogate o-Terphenyl	%	85	88	85

PAHs in Soil						
Our Reference		334173-1	334173-2	334173-3	334173-4	334173-5
Your Reference	UNITS	GS23-344/1A	GS23-344/1B	GS23-344/2A	GS23-344/2B	GS23-344/3A
Depth		0.7-0.9m	2.1-2.3m	0.3-0.5m	0.5-0.7m	0.1-0.2m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	0.3	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.1	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	1.2	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	112	109	124	109	106

PAHs in Soil						
Our Reference		334173-6	334173-7	334173-8	334173-9	334173-10
Your Reference	UNITS	GS23-344/3B	GS23-344/4A	GS23-344/4B	GS23-344/5A	GS23-344/5B
Depth		2.1-2.3m	0.2-0.35m	1.05-1.25m	0.3-0.35m	0.75-0.80m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.1	<0.1	0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.2	<0.1	0.2	<0.1
Pyrene	mg/kg	<0.1	0.2	<0.1	0.2	<0.1
Benzo(a)anthracene	mg/kg	<0.1	0.1	<0.1	0.3	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	0.3	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.1	<0.05	0.2	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	0.75	<0.05	1.5	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	112	119	1.1	113	108

PAHs in Soil						
Our Reference		334173-11	334173-12	334173-13	334173-14	334173-15
Your Reference	UNITS	GS23-344/F6A	GS23-344/6A	GS23-344/7A	GS23-344/7B	GS23-344/8A
Depth		0.3-0.35m	0.5-0.55m	0.4-0.45m	0.95-1.0m	0.05-0.1m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	0.3	0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	0.3	<0.1
Phenanthrene	mg/kg	0.1	<0.1	<0.1	3.4	0.8
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.9	0.2
Fluoranthene	mg/kg	0.1	<0.1	<0.1	3.7	1.8
Pyrene	mg/kg	0.1	<0.1	<0.1	5.0	1.6
Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	3.1	1.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	1.7	0.6
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	2.4	1
Benzo(a)pyrene	mg/kg	0.06	<0.05	<0.05	1.8	0.93
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	0.6	0.5
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	0.2	0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	0.8	0.6
Total +ve PAH's	mg/kg	0.5	<0.05	<0.05	24	9.7
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	2.7	1.4
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	2.7	1.4
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	2.7	1.4
Surrogate p-Terphenyl-d14	%	104	103	115	113	120

PAHs in Soil				
Our Reference		334173-16	334173-17	334173-18
Your Reference	UNITS	GS23-344/8B	GS23-344/9A	GS23-344/9B
Depth		0.5-0.55m	0.05-0.1m	0.4-0.45m
Date Sampled		21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.2	<0.1
Pyrene	mg/kg	<0.1	0.2	<0.1
Benzo(a)anthracene	mg/kg	<0.1	0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.1	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	0.65	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	111	115	109

Acid Extractable metals in soil						
Our Reference		334173-1	334173-2	334173-3	334173-4	334173-5
Your Reference	UNITS	GS23-344/1A	GS23-344/1B	GS23-344/2A	GS23-344/2B	GS23-344/3A
Depth		0.7-0.9m	2.1-2.3m	0.3-0.5m	0.5-0.7m	0.1-0.2m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Date analysed	-	05/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023
Arsenic	mg/kg	5	<4	13	<4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	31	19	16	29	16
Copper	mg/kg	13	10	35	12	18
Lead	mg/kg	13	9	38	11	12
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	26	12	13	19	31
Zinc	mg/kg	20	12	73	17	26

Acid Extractable metals in soil						
Our Reference		334173-6	334173-7	334173-8	334173-9	334173-10
Your Reference	UNITS	GS23-344/3B	GS23-344/4A	GS23-344/4B	GS23-344/5A	GS23-344/5B
Depth		2.1-2.3m	0.2-0.35m	1.05-1.25m	0.3-0.35m	0.75-0.80m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Date analysed	-	05/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023
Arsenic	mg/kg	<4	17	<4	14	<4
Cadmium	mg/kg	<0.4	0.7	<0.4	<0.4	<0.4
Chromium	mg/kg	23	18	29	27	29
Copper	mg/kg	10	64	11	44	9
Lead	mg/kg	9	100	12	75	10
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	16	19	18	27	10
Zinc	mg/kg	17	96	15	74	13

Acid Extractable metals in soil						
Our Reference		334173-11	334173-12	334173-13	334173-14	334173-15
Your Reference	UNITS	GS23-344/F6A	GS23-344/6A	GS23-344/7A	GS23-344/7B	GS23-344/8A
Depth		0.3-0.35m	0.5-0.55m	0.4-0.45m	0.95-1.0m	0.05-0.1m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Date analysed	-	05/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023
Arsenic	mg/kg	10	<4	18	7	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	29	29	23	25	18
Copper	mg/kg	49	12	53	15	9
Lead	mg/kg	48	13	83	17	9
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	42	12	36	15	19
Zinc	mg/kg	140	23	51	16	18

Acid Extractable metals in soil				
Our Reference		334173-16	334173-17	334173-18
Your Reference	UNITS	GS23-344/8B	GS23-344/9A	GS23-344/9B
Depth		0.5-0.55m	0.05-0.1m	0.4-0.45m
Date Sampled		21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	03/10/2023	03/10/2023	03/10/2023
Date analysed	-	05/10/2023	05/10/2023	05/10/2023
Arsenic	mg/kg	4	8	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	20	13	23
Copper	mg/kg	11	18	10
Lead	mg/kg	11	22	9
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	14	11	17
Zinc	mg/kg	23	27	16

Misc Inorg - Soil						
Our Reference		334173-1	334173-2	334173-3	334173-4	334173-5
Your Reference	UNITS	GS23-344/1A	GS23-344/1B	GS23-344/2A	GS23-344/2B	GS23-344/3A
Depth		0.7-0.9m	2.1-2.3m	0.3-0.5m	0.5-0.7m	0.1-0.2m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
pH 1:5 soil:water	pH Units	8.4	9.1	8.6	8.9	8.8
Electrical Conductivity 1:5 soil:water	µS/cm	410	310	560	380	210

Misc Inorg - Soil						
Our Reference		334173-6	334173-7	334173-8	334173-9	334173-10
Your Reference	UNITS	GS23-344/3B	GS23-344/4A	GS23-344/4B	GS23-344/5A	GS23-344/5B
Depth		2.1-2.3m	0.2-0.35m	1.05-1.25m	0.3-0.35m	0.75-0.80m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
pH 1:5 soil:water	pH Units	9.2	7.9	7.5	8.6	8.6
Electrical Conductivity 1:5 soil:water	µS/cm	230	970	720	330	220

Misc Inorg - Soil						
Our Reference		334173-11	334173-12	334173-13	334173-14	334173-15
Your Reference	UNITS	GS23-344/F6A	GS23-344/6A	GS23-344/7A	GS23-344/7B	GS23-344/8A
Depth		0.3-0.35m	0.5-0.55m	0.4-0.45m	0.95-1.0m	0.05-0.1m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
pH 1:5 soil:water	pH Units	8.2	6.7	8.5	8.5	8.5
Electrical Conductivity 1:5 soil:water	µS/cm	910	540	180	450	430

Misc Inorg - Soil				
Our Reference		334173-16	334173-17	334173-18
Your Reference	UNITS	GS23-344/8B	GS23-344/9A	GS23-344/9B
Depth		0.5-0.55m	0.05-0.1m	0.4-0.45m
Date Sampled		21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	03/10/2023	03/10/2023	03/10/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023
pH 1:5 soil:water	pH Units	8.6	8.8	8.4
Electrical Conductivity 1:5 soil:water	µS/cm	540	150	390

Moisture						
Our Reference		334173-1	334173-2	334173-3	334173-4	334173-5
Your Reference	UNITS	GS23-344/1A	GS23-344/1B	GS23-344/2A	GS23-344/2B	GS23-344/3A
Depth		0.7-0.9m	2.1-2.3m	0.3-0.5m	0.5-0.7m	0.1-0.2m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Moisture	%	24	16	12	18	6.1

Moisture						
Our Reference		334173-6	334173-7	334173-8	334173-9	334173-10
Your Reference	UNITS	GS23-344/3B	GS23-344/4A	GS23-344/4B	GS23-344/5A	GS23-344/5B
Depth		2.1-2.3m	0.2-0.35m	1.05-1.25m	0.3-0.35m	0.75-0.80m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Moisture	%	17	15	21	15	13

Moisture						
Our Reference		334173-11	334173-12	334173-13	334173-14	334173-15
Your Reference	UNITS	GS23-344/F6A	GS23-344/6A	GS23-344/7A	GS23-344/7B	GS23-344/8A
Depth		0.3-0.35m	0.5-0.55m	0.4-0.45m	0.95-1.0m	0.05-0.1m
Date Sampled		21/09/2023	21/09/2023	21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/09/2023	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023	03/10/2023	03/10/2023
Moisture	%	8.5	13	12	15	2.9

Moisture				
Our Reference		334173-16	334173-17	334173-18
Your Reference	UNITS	GS23-344/8B	GS23-344/9A	GS23-344/9B
Depth		0.5-0.55m	0.05-0.1m	0.4-0.45m
Date Sampled		21/09/2023	21/09/2023	21/09/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	29/09/2023	29/09/2023	29/09/2023
Date analysed	-	03/10/2023	03/10/2023	03/10/2023
Moisture	%	12	7.0	16

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Method ID	Methodology Summary
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	334173-2
Date extracted	-			29/09/2023	1	29/09/2023	29/09/2023		29/09/2023	29/09/2023
Date analysed	-			03/10/2023	1	03/10/2023	03/10/2023		03/10/2023	03/10/2023
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	115	115
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	115	115
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	114	113
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	111	108
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	116	118
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	118	118
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	121	121
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	68	1	82	65	23	74	73

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date extracted	-			[NT]	11	29/09/2023	29/09/2023		29/09/2023	[NT]
Date analysed	-			[NT]	11	03/10/2023	03/10/2023		03/10/2023	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	11	<25	<25	0	130	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	11	<25	<25	0	130	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	11	<0.2	<0.2	0	128	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	11	<0.5	<0.5	0	124	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	133	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	11	<2	<2	0	135	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	136	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	11	65	68	5	82	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	334173-2
Date extracted	-			29/09/2023	1	29/09/2023	29/09/2023		29/09/2023	29/09/2023
Date analysed	-			30/09/2023	1	30/09/2023	30/09/2023		30/09/2023	30/09/2023
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	97	95
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	97	101
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	<100	<100	0	106	98
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	97	95
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	<100	<100	0	97	101
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	<100	<100	0	106	98
Surrogate o-Terphenyl	%		Org-020	89	1	86	84	2	117	89

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date extracted	-			[NT]	11	29/09/2023	29/09/2023		29/09/2023	[NT]
Date analysed	-			[NT]	11	30/09/2023	30/09/2023		30/09/2023	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	113	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	114	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	110	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	113	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	114	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	110	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	11	86	87	1	96	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	334173-2
Date extracted	-			29/09/2023	1	29/09/2023	29/09/2023		29/09/2023	29/09/2023
Date analysed	-			03/10/2023	1	03/10/2023	03/10/2023		03/10/2023	03/10/2023
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	92	86
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	89	83
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	84	78
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	96
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	86	84
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	89
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	85	79
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	<0.05	<0.05	0	116	100
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	107	1	112	111	1	106	103

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	29/09/2023	29/09/2023		[NT]	[NT]
Date analysed	-			[NT]	11	03/10/2023	03/10/2023		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	0.2	67	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	0.2	67	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	0.2	67	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	11	0.06	0.09	40	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	11	104	108	4	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	334173-2
Date prepared	-			03/10/2023	1	03/10/2023	03/10/2023		03/10/2023	03/10/2023
Date analysed	-			05/10/2023	1	05/10/2023	05/10/2023		05/10/2023	05/10/2023
Arsenic	mg/kg	4	Metals-020	<4	1	5	<4	22	111	101
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	105	90
Chromium	mg/kg	1	Metals-020	<1	1	31	31	0	109	106
Copper	mg/kg	1	Metals-020	<1	1	13	13	0	107	115
Lead	mg/kg	1	Metals-020	<1	1	13	12	8	107	100
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	88	94
Nickel	mg/kg	1	Metals-020	<1	1	26	25	4	110	101
Zinc	mg/kg	1	Metals-020	<1	1	20	19	5	110	96

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	03/10/2023	03/10/2023		[NT]	[NT]
Date analysed	-			[NT]	11	05/10/2023	05/10/2023		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	11	10	12	18	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	11	<0.4	0.5	22	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	11	29	25	15	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	11	49	52	6	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	48	46	4	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	11	42	32	27	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	11	140	190	30	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date prepared	-			03/10/2023	1	03/10/2023	03/10/2023		03/10/2023	[NT]
Date analysed	-			03/10/2023	1	03/10/2023	03/10/2023		03/10/2023	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	8.4	8.4	0	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	410	410	0	103	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	03/10/2023	03/10/2023		[NT]	[NT]
Date analysed	-			[NT]	11	03/10/2023	03/10/2023		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	11	8.2	8.2	0	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	11	910	890	2	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Samples were out of the recommended holding time for this analysis pH/EC.