Aitken Rowe
GEOTECHNICAL ENGINEERING

Geotechnical Engineering
Environmental Consultancy
Soil Concrete Aggregate Testing
NATA Accredited Laboratories

ABN 53 058 315 138 ACN 058 315 138

27 June 2023 Reg. No.: S23-159

Bland Shire Council
PO Box 21
West Wyalong, NSW 2671

Attention: Mr. Tim Wark – Contract Engineer

Dear Tim,

PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN – PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS, CENTRAL ROAD, WEST WYALONG, NSW

Further to your request in response to our quotation, Q23-209 dated 20 April 2023, we carried out the fieldwork at the location of the existing (BH1) and proposed road extension (BH2 to BH5) of Shamrock Street at the above proposed West Wyalong Business Park six lot subdivision on 9 May 2023, which included drilling of five (5) boreholes (BH1 to BH5) and sampling along the existing and proposed road extension alignment of Shamrock Street.

The boreholes were taken to the depth of 4.0m using our trailer mounted drill rig and representative samples were recovered from the boreholes for relevant laboratory testing. Dynamic Cone Penetrometer (DCP) testing was carried out at each borehole location (BH1 to BH5) from the existing natural surface level and at the depth of 0.9m to 1.7m below the existing surface level to assess the strength of the underlying material. The location of the boreholes and DCP tests are shown in the attached borehole and DCP test location plan.

The purpose of the investigation was to establish the subsurface condition and make recommendations on the pavement thickness design of the proposed road and for the foundation of the street lights of the proposed West Wyalong Business Park subdivision.

1. Site Description

The site for the proposed West Wyalong Business Park subdivision is located directly south and south-east of Shamrock Street and directly east of Central Road and is identified as Lots 1133, 1233, 1243 and 1257, DP 753135, Central Road, West Wyalong, NSW. The site was noted as generally flat

with a groundcover of sparse grass/weeds and scattered trees across the subject site as noted at the time of the investigation.

2. Subsurface Condition

The boreholes drilled along the existing (BH1) and proposed (BH2 to BH5) road alignment of Shamrock Street revealed that the site is underlain by pavement fill material (in BH1 only) comprising a 20mm thick bitumen seal and fine to coarse grained silty sandy gravel of 40mm thickness to 0.06m overlying fine to coarse grained clayey sand to 0.3m in BH1 and fill comprising topsoil (in BH2 & BH4 only) to 0.1m in BH2 and 0.2m in BH4 and natural topsoil (in BH3 & BH5 only) to 0.1m in BH3 & BH5 overlying natural residual material comprising low, medium and medium to high plasticity sandy clay (in BH1 to BH5) and high plasticity clay (in BH2 only) to 0.4m to 0.6m in BH1 to BH5 (refer to attached Materials Schedule & Logs) which in turn is underlain by extremely weathered, extremely low strength and highly weathered, very low strength, siltstone bedrock, extending to the borehole termination depth at 4.0m in BH1 to BH5.

The moisture condition of the underlying pavement fill material was noted to be generally dry in the gravel-based and sand-based fill material in BH1 with the underlying natural subgrade material noted to be generally less than plastic limit throughout the tested clay-based profile and dry, dry to moist and moist throughout the siltstone bedrock within the investigation depth in BH1 to BH5 at the time of the investigation. No groundwater or seepage was encountered during the course of the drilling in the boreholes drilled at the time of the investigation. However, it should be noted that variations to the groundwater level could fluctuate with changes to the season, temperature and rainfall.

The pavement fill material appeared to have been placed “uncontrolled” and “well compacted” in BH1 as visually assessed at the time of the investigation. The DCP test results and visual observation of the resistance by auger TC bit, indicate the underlying natural alluvial clay-based material (below fill & topsoil) to be generally very stiff to hard consistency throughout the investigated depth in BH1 BH3 and BH4, stiff to very stiff consistency in the upper profile then increasing to very stiff to hard consistency throughout the tested investigated depth in BH2 and stiff consistency in the upper profile then increasing to very stiff to hard consistency throughout the investigated depth in BH5 at the time of the investigation (refer to attached Materials Schedule & Logs).

The visual inspection of the rock cuttings from the boreholes and the observation of drilling resistance indicates the underlying siltstone bedrock to be generally extremely weathered, extremely low in the upper profile then increasing to highly weathered, very low strength within the investigated depth in BH1 to BH5 (refer to attached Materials Schedule & Logs).

The Materials Schedule & Logs with explanatory notes and DCP test reports are herewith attached.

3. Laboratory Testing

The relevant laboratory testing which included particle size distribution test, Atterberg Limit test, moisture content determination test, Linear Shrinkage (LS) test, Standard Maximum Dry Density (SMDD) and California Bearing Ratio (CBR) tests on the recovered subgrade samples, were undertaken at our NATA accredited testing laboratory in Wagga Wagga, NSW. The samples for CBR testing were compacted at 95% of SMDD and at nearest 100% of Standard Optimum Moisture Content (SOMC) and soaked for 10 days.

The laboratory test reports for particle size distribution, Atterberg Limit, moisture content determination, LS, SMDD and CBR tests are herewith attached. The test results for field moisture content determination test (FMC), SOMC and CBR tests are also incorporated in the Materials Schedule & Logs.

4. Site Preparation and Earthworks

It is assessed that the existing pavement fill material (in BH1 only) appeared to have been placed "well compacted" but "uncontrolled" and therefore should be removed for the new construction as required unless it is proven to be "controlled fill" and "well compacted" throughout. If it were required to maintain the existing grade for the proposed road upgrade, it would require excavation of existing material. In this scenario, we recommend excavation of existing pavement fill material first and stockpile and then excavate subgrade material as required.

In general, the following site preparation is recommended once the pavement, fill and subgrade materials are removed as required:

- Strip all topsoil, pavement fill and unsuitable material, if any, in the area of the proposed road upgrade and road extension. It should be noted that the pavement fill material generally extended to 0.3m at the location of BH1 and topsoil to 0.1m to 0.2m at the location of BH2 to BH5 (refer to attached Material Schedule & Logs).
- Once the pavement fill and unsuitable materials, if any, are removed as required, the exposed natural subgrade material should then be scarified to a depth of about 200mm; moisture conditioned to within $\pm$2% of Standard Optimum Moisture Content (SOMC) and compacted to a minimum of 98% of Standard Maximum Dry Density (SMDD).
- 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
- Any soft, loose or heave areas, if detected during the process, should be excavated down at least 0.5m and backfilled with appropriate approved materials compacted in 150mm thick layers to the minimum equivalent density of 98% of SMDD.
- Any area of exposed subgrade, which exhibits shrinkage cracking and does not require recompaction, 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 material can be placed as required and compacted to the compaction requirements as given above. Any excavated fill material, if undertaken, may be used provided any organic matter and unsuitable materials are completely removed.

The degree of compaction of any fill placement should be verified by a NATA accredited testing authority to ensure that it achieves specified density as specified above. As the fill is likely to be laid on the clay-based formation, the compaction shall be carried out with minimum amount of water required to achieve the required density. The boundaries of the fill areas should be sloped to a maximum batter of 1.0 Vertical to 2.0 Horizontal as required.

If the subgrade is to be stabilised, then the exposed clay-based subgrade should be stabilised with lime additive as required. It is anticipated that mixing 3% of appropriate additive to the soil material should provide required strength for the subgrade. However, this should be confirmed with trial tests in the laboratory prior to adoption for the construction. **It should be noted that the weathered rock may be exposed in places after the removal of fill and topsoil material and therefore the stabilisation of subgrade may not be feasible.**

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

5. Foundation Design for Proposed Street lights

The design parameters given in Table 1 below may be adopted for the footing system founded on the underlying materials. The geotechnical design parameters given in Table 1 were estimated from the DCP test results and visual assessment of the soil and rock material at the borehole locations.

Table 1 Geotechnical Design Parameters

Location	Depth (m)	Material Description	ABP (kPa)	ASA (C) (kPa)	AOF (•)	USS (kPa)	Density (kN/m^3)	Modulus of subgrade reaction (kN/m^3)**	Passive Resistance Pressure (P_p)	Elastic Modulus (MPa)
BH1	0.3-0.6	Sandy Clay	100	10*	24	30	16.5	10,000.00	39H^	8.0
	0.6-3.0	Siltstone (EW)	500	50	38	-	20.0	50,000.00	84H^	35.0
	3.0-4.0#	Siltstone (HW)	750	75	40	-	21.0	75,000.00	97H^	40.0
BH2	0.1-0.6	Sandy Clay/Clay	100	10*	24	30	16.5	10,000.00	39H^	8.0
	0.6-3.0	Siltstone (EW)	500	50	38	-	20.0	50,000.00	84H^	35.0
	3.0-4.0#	Siltstone (HW)	750	75	40	-	21.0	75,000.00	97H^	40.0
BH3	0.1-0.4	Sandy Clay	100	10*	24	30	16.5	10,000.00	39H^	8.0
	0.4-0.8	Siltstone (EW)	300	30	36	-	19.0	30,000.00	68H^	30.0
	0.8-2.5	Siltstone (EW)	500	50	38	-	20.0	50,000.00	84H^	35.0
	2.5-4.0#	Siltstone (HW)	750	75	40	-	21.0	75,000.00	97H^	40.0

Table 1 (Continued) Geotechnical Design Parameters

BH4	0.2-0.4	Sandy Clay	100	10*	24	30	16.5	10,000.00	39H^	8.0
	0.4-2.5	Siltstone (EW)	500	50	38	-	20.0	50,000.00	84H^	35.0
	2.5-4.0#	Siltstone (HW)	750	75	40	-	21.0	75,000.00	97H^	40.0
BH5	0.1-0.5	Sandy Clay	100	10*	24	30	16.5	10,000.00	39H^	8.0
	0.5-2.7	Siltstone (EW)	500	50	38	-	20.0	50,000.00	84H^	35.0
	2.7-4.0#	Siltstone (HW)	750	75	40	-	21.0	75,000.00	97H^	40.0

Note:

ABP - Allowable (End) Bearing Pressure
ASA(C) - Allowable Side Adhesion (Compression)
AOF - Angle of Friction
USS - Undrained Shear Strength
Density - Density (Unit Weight) (at in-situ moisture)
H^ - The pile socket length below ground level in the soil material in meters.
- The borehole termination depth.
* - The side adhesion within the top 1.5m depth of natural soil shall be ignored.
** - **Factor of safety of 2.5 is adopted in estimating the Modulus of Subgrade Reaction.**

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 1 for the above material.

The footing excavations, particularly in the clay-based, silt-based or weathered bedrock 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 seepage may be encountered during the footing excavation if the footing excavation is undertaken after prolonged period of extreme rainfall 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 1 should be reduced by 50%.

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 subgrade, which has not been exposed to moisture, and pour the concrete immediately. Care would be required to ensure footing bases are cleaned of loosened and remoulded debris. Some localized seepage or pile wall instability requiring temporary liners may be encountered within natural materials if footing excavations are exposed for longer period of time.

It is recommended to remove all loose and wet material, if any, from the base of the excavation prior to pouring any concrete as required. It is also recommended to incorporate proper drainage measures around the perimeter of the structure. If water ponds in the base of the excavation or the base materials are affected by moisture ingress, then this material should be excavated to expose the subgrade, which has not been exposed to moisture and backfill or pour the concrete immediately. If a delay in concrete pour is anticipated, then a blinding layer should be placed over the base of the excavation to prevent softening of the foundation base.

It is also highly recommended to undertake inspections of the footing construction by an experienced geotechnical engineer to ensure that the specified allowable bearing capacity is achieved for the footing system during the construction.

6. Subgrade – Existing and Proposed Subdivision Road (Shamrock Street)

The natural subgrade material (below fill and topsoil) comprises residual material comprising low, medium and medium to high plasticity sandy clay and high plasticity clay overlying extremely weathered, extremely low strength and highly weathered, very low strength, siltstone bedrock (refer to attached Materials Schedule & Log).

The laboratory 10 day soaked CBR tests indicated the CBR values of 6% on low plasticity sandy clay and 4.5% on low to medium and medium plasticity sandy clay material, which were compacted at 95% of SMDD and at nearest 100% Standard Optimum Moisture Content (SOMC). The in-situ CBR values correlated from DCP tests indicate CBR values ranging from 12 to 45% on the similar natural subgrade materials.

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 material. 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), which could be contributing factor in resulting high CBR values in the field.

It is noted that the West Wyalong area has an annual average rainfall of <1000mm, the moisture content of the materials would be generally less than Optimum Moisture Content with provision of

drainage measures across the site and the top 200mm of subgrade would be scarified and re-compacted to 98% SMDD and prepared as specified in Section 4. Based on these evaluations, the design subgrade CBR value of 4.0% may be adopted for the proposed road of the subdivision.

7. Pavement Design - Proposed Subdivision Road

Based on the traffic data supplied by the client representative, Mr. Tim Wark in the email dated 27 June 2023, the following pavement design parameters as given in Table 2 are used for the calculation of the design traffic for the existing and proposed road of the subdivision.

Table 2 Design Parameters

Design Parameters	**Existing & Proposed Subdivision Road**
AADT 2023	400
Heavy Vehicle %	25.0%
Axle-pairs/vehicle	1.0
Annual growth	7.5%
Design reliability factor	1.0
Design Life	40 years
ESA/HVAG*	1.037
Use of Design Lanes %	100
Cumulative number of heavy vehicle axle groups (Ndt)	**$1.16x10^7$ HVAGs**
Calculated Design Traffic (DESA)	**$1.20x10^7$ ESA**

Note: * - Refer NSW RMS 11.050 Version 3.0, Aug 2018.

In adopting the design subgrade CBR of 4.0% for the subgrade as prepared in Section 4 above and the design traffic of $1.20x10^7$ ESA as discussed above, we recommend the following pavement design options for the existing and proposed subdivision road.

<u>Design Option 1 – Granular Pavement (DGB20 & Select Fill material) with Asphalt or 2 Coat Spray Seal</u>

40mm Asphalt (AC14) – 2200MPa OR 7mm Primerseal followed by Single 14mm Seal <u>OR</u> 14/7mm Double Seal
250mm TfNSW DGB20 quality or equivalent (Ev= 350MPa)
320mm Select Fill material* (Ev=150MPa) (Construct in two equivalent layer)
Subgrade CBR 4.0%

Note: * - (i) Select fill material should have a CBR>15% and a plasticity index (PI) <12% in its original state before addition of additive.

(ii) Select fill material should be modified with 2% hydrated lime if CBR <15% and/or PI>12%.

The above pavement will give a design life of 41 years, according to Circly 7.0 (7 November 2022), 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 (TfNSW DGS20 & Select Fill 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
250mm TfNSW DGS20 quality or equivalent (Ev= 250MPa)
340mm Select Fill material* (Ev=150MPa) (Construct in two equivalent layer)
Subgrade CBR 4.0%

Note: * - (i) Select fill material should have a CBR>15% and a plasticity index (PI) <12% in its original state before addition of additive.

(ii) Select fill material should be modified with 2% hydrated lime if CBR <15% and/or PI>12%.

The above pavement will give a design life of 42 years, according to Circly 7.0 (7 November 2022), 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 – Pavement with Asphalt Concrete & Granular Material (TfNSW DGB20 Material & Select Fill) and Stabilised Subgrade

40mm Asphalt (AC14) – 2200MPa OR 7mm Primerseal followed by Single 14mm Seal OR 14/7mm Double Seal
160mm TfNSW DGB20 quality or equivalent (Ev= 350MPa)
170mm Select Fill Material * (Ev=150Mpa)
300mm Stabilised Clay subgrade layer (stabilised with 3% additive as appropriate) (Ev= 100MPa)
Subgrade CBR 4.0%

Note: * - (i) Select fill material should have a CBR>15% and a plasticity index (PI) <12% in its original state before addition of additive.

(ii) Select fill material should be modified with 2% hydrated lime if CBR <15% and/or PI>12%.

The above pavement will give a design life of 40 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 layer (bitumen seal or asphalt concrete) is not part of the structural design of the pavement.**

Design Option 4 – Granular Pavement with Bituminous Seal or Asphalt (Local Quality DGS20, DGS40) & Stabilised Subgrade

40mm Asphalt (AC14) – 2200MPa OR 7mm Primerseal followed by Single 14mm Seal OR 14/7mm Double Seal
170mm Local Quality DGS20 or equivalent (Ev= 200MPa)
170mm Local Quality DGS40 or equivalent (Ev=200MPa)
300mm Stabilised Clay subgrade layer (stabilised with 3% additive as appropriate) (Ev= 100MPa)
Subgrade CBR 4.0%

The above pavement will give a design life of 40 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 layer (bitumen seal or asphalt concrete) is not part of the structural design of the pavement.**

8. General Comment

- Occasionally, the subsurface soil conditions between the completed boreholes may be found 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 & NGS20/40 or TfNSW DGB20/DGS20 or local quality for DGS20/40 specification. 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 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 material of silty sandy gravel and silty sand encountered in the existing pavement (BH1) may be used as select fill equivalent in the new construction as appropriate.
- The pavement materials shall be compacted to a minimum of 102% SMDD for base and 100% SMDD for sub-base/select fill layer or as per Council Specification. It is highly recommended that the degree of compaction shall be verified by relevant NATA accredited testing laboratory.
- 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 different from new materials, particularly if the existing or new pavement has a stabilised layer. The trench drain of 300x300mm shall be placed below heavily bound 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 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
Senior Geotechnical Engineer

Tin Maung
Principal Geotechnical Engineer (Director)

Attachments:

- Addendum
- Plan showing site location
- Plans showing borehole and DCP test locations
- Material Schedule and Logs with explanatory note

- Dynamic Cone Penetrometer test reports
- Laboratory test reports
- Design Traffic Calculation Sheet
- Circly Design Print-outs
- Essential Energy Street Lighting Footing Compliance

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.

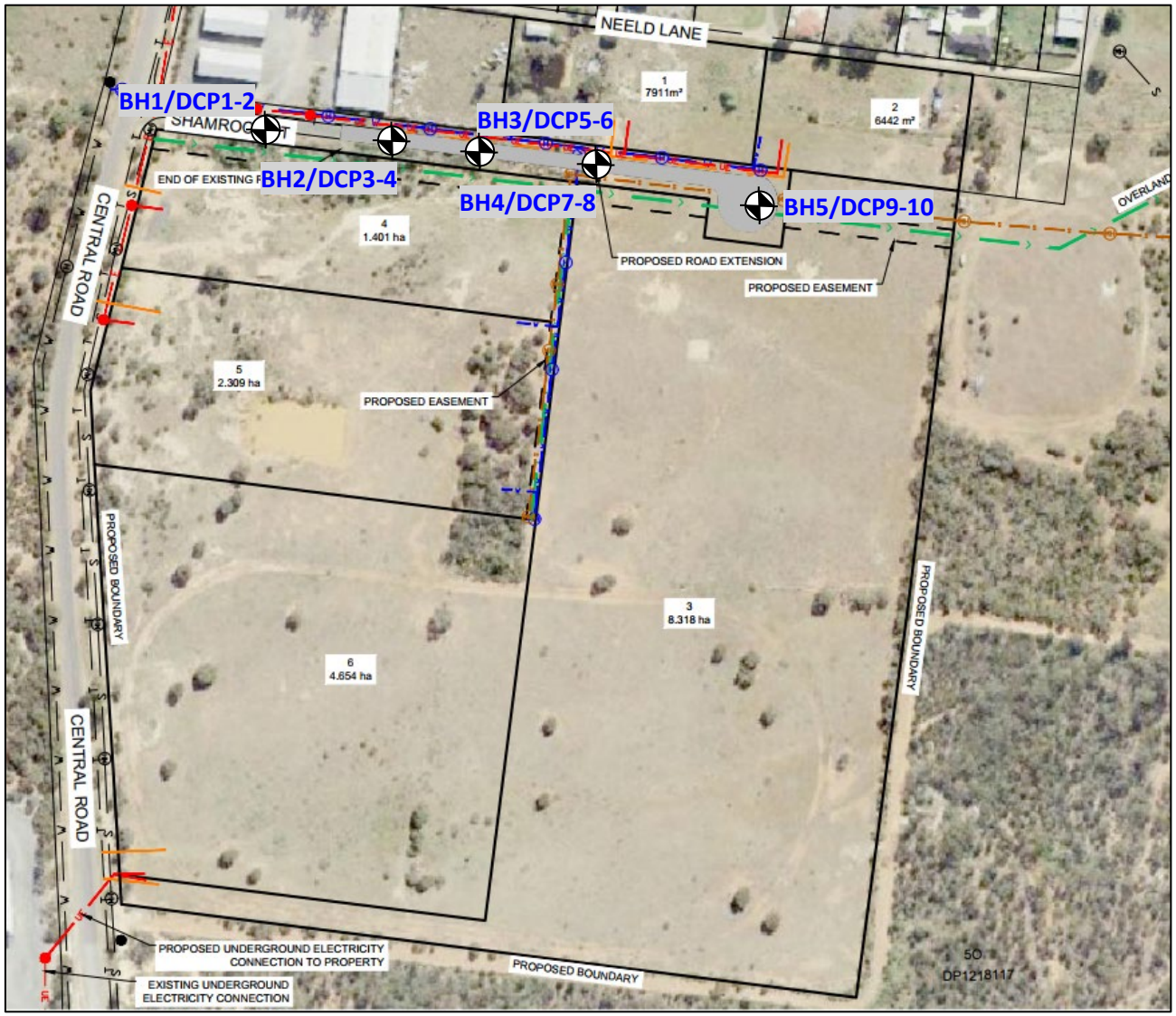
Aitken Rowe Testing Laboratories Pty Ltd

Registration Number: S23-159

Client: BLAND SHIRE COUNCIL - WEST WYALONG, NSW

Project: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN - PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS, CENTRAL ROAD, WEST WYALONG, NSW

SITE LOCATION PLAN



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BOREHOLE & DCP TEST LOCATION PLAN

Aitken Rowe Testing Laboratories Pty Ltd

4/2 Riedell Street, Wagga Wagga NSW 2650

Pavement & Subgrade Investigation - Materials Schedule and Log

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW

PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN

PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS, CENTRAL ROAD, WEST WYALONG, NSW

STAFF: JAG **SAMPLING METHOD :** AS1289.1.2.1 **CLAUSE :** 6.5.3

PAGE: 1 OF 2

DATE: 9/05/2023

REGO. NO.: S23-159

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.)	
BH1		0-20		Bitumen Seal									
N: 6246122	B1	20-60	GM	FILL: Silty Sandy GRAVEL; fine to coarse grained, fine to coarse sand, fines of low	D	D							FILL: Appears well compacted
E: 0520589				plasticity, grey									'Uncontrolled'
	F1	60-300	SC	FILL: Clayey SAND; fine to coarse grained, trace gravel, fines of low plasticity,	D	D		7.9					FILL: Appears well compacted
				orange brown									'Uncontrolled'
	SG1	300-600	CI	Sandy CLAY; medium plasticity, fine to coarse sand, trace gravel, orange	MC<PL	VSt.-H	19.4	14.0	0.72	300-600	29	4.5	NATURAL - Residual
	SG1A	600-3000		SILTSTONE; extremely weathered, extremely low strength, pink grey	D								
	SG1B	3000-4000		SILTSTONE; highly weathered, very low strength, cream pink	D								
				End of Borehole (BH1) @ 4.0m									
BH2		0-100	SM	FILL/TOPSOIL: Silty SAND; fine to coarse grained, fines of low plasticity, brown	M	MD							FILL: Appears moderately compacted 'Uncontrolled'
N: 6246115	SG2	100-400	CI	Sandy CLAY; medium plasticity, fine to coarse sand, trace gravel, red brown	MC>PL	St.-VSt.		15.6		100-400	12		NATURAL - Residual
E: 0520658	SG2A	400-600	CH	CLAY; high plasticity, with fine to coarse sand, orange	MC<PL	VSt.-H		18.2		400-700	39		
	SG2B	600-3000		SILTSTONE; extremely weathered, extremely low strength, cream grey	M								
	SG2C	3000-4000		SILTSTONE; highly weathered, very low strength, cream	D-M								
				End of Borehole (BH2) @ 4.0m									
BH3		0-100	ML	TOPSOIL: Sandy SILT; low plasticity, fine to coarse sand, brown	MC<PL	VSt.							NATURAL
N: 6246108	SG3	100-400	CL	Sandy CLAY; low plasticity, fine to coarse sand, trace gravel, orange brown	MC<PL	VSt.-H	13.9	7.1	0.51	100-400	39	6	Residual
E: 0520709	SG3A	400-2500		SILTSTONE; extremely weathered, extremely low strength, cream brown	D								
	SG3B	2500-4000		SILTSTONE; highly weathered, very low strength, cream pink	D								
				End of Borehole (BH3) @ 4.0m									

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Pavement & Subgrade Investigation - Materials Schedule and Log

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW

PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN

PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS, CENTRAL ROAD, WEST WYALONG, NSW

STAFF: JAG **SAMPLING METHOD :** AS1289.1.2.1 **CLAUSE :** 6.5.3

PAGE: 2 OF 2

DATE: 9/05/2023

REGO. NO.: S23-159

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.)	
BH4		0-200	CL	FILL/TOPSOIL: Sandy CLAY; low plasticity, fine to coarse sand, trace gravel, red	MC<PL	F-VSt.							FILL: Appears moderately compacted
N: 6246094				orange									'Uncontrolled'
E: 0520761		200-400	CL	Sandy CLAY; low plasticity, fine to coarse sand, trace gravel, orange brown	MC<PL	VSt.-H				200-400	45		NATURAL - Residual
	SG4	400-1500		SILTSTONE; extremely weathered, extremely low strength, cream brown	D								
		1500-2500		SILTSTONE; extremely weathered, extremely low strength, cream yellow	D								
		2500-4000		SILTSTONE; highly weathered, very low strength, cream pink	D								
				End of Borehole (BH4) @ 4.0m									
BH5		0-100	SM	TOPSOIL: Silty SAND; fine to coarse grained, fines of low plasticity, brown	M	MD							NATURAL
N: 6246080	SG5	100-300	CL-CI	Sandy CLAY; low to medium plasticity, fine to coarse sand, trace gravel, orange brow	MC<PL	St.	20.0	11.2	0.56	100-300	14	4.5	Residual
E: 0520819	SG5A	300-500	CH	Sandy CLAY; medium to high plasticity, fien to coarse sand, orange brown	MC<PL	VSt.-H		16.8		300-600	42		
	SG5B	500-2700		SILTSTONE; extremely weathered, extremely low strength, pale pink brown	D-M								
	SG5C	2700-4000		SILTSTONE; highly weathered, very low strength, cream	D-M								
				End of Borehole (BH5) @ 4.0m									

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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.

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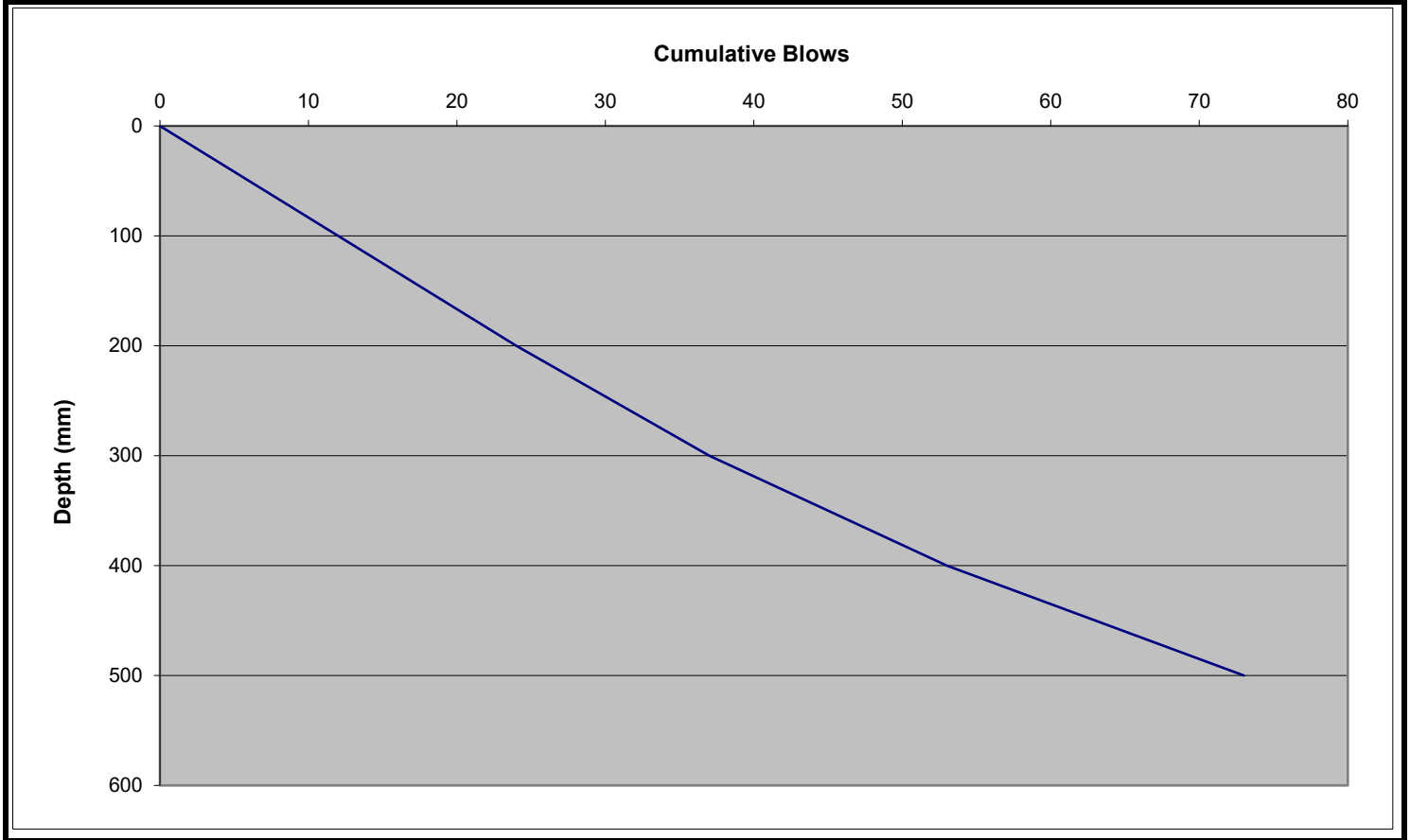
DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 1 OF: 10 ***DCP: 1 (BH1)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **S23-159**
PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): 300
SOIL DESCRIPTION: REFER TO 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	12	28	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	12	28	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	13	32	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	16	41	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	20	55	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	END	*	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	*	*	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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REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 20/06/2023

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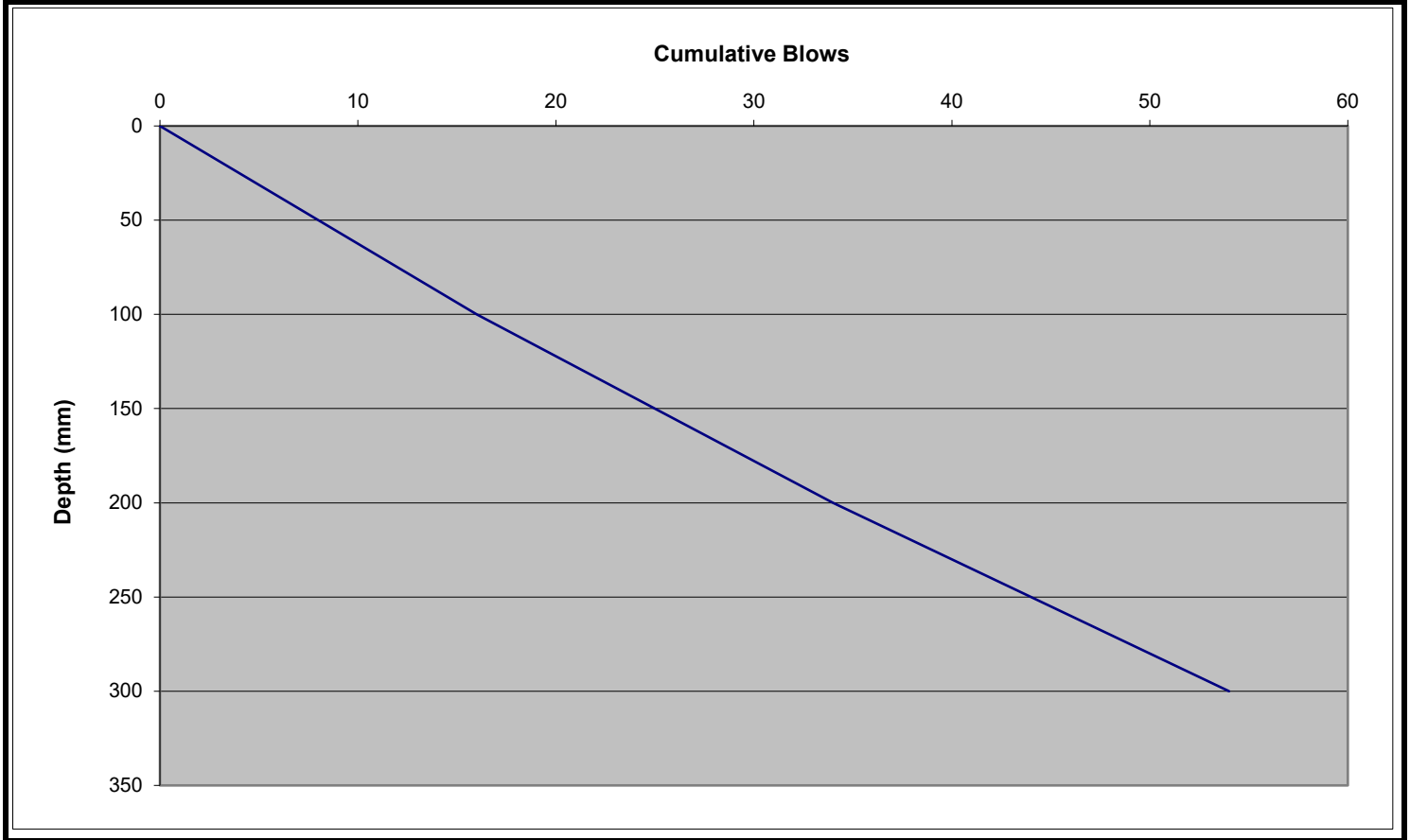
DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 2 OF: 10 ***DCP: 2 (BH1)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	REGISTRATION NO: **S23-159**
	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): 1700
SOIL DESCRIPTION: REFER TO 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	16	41	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	18	48	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	20	55	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	END	*	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	*	*	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	*	*	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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REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 20/06/2023

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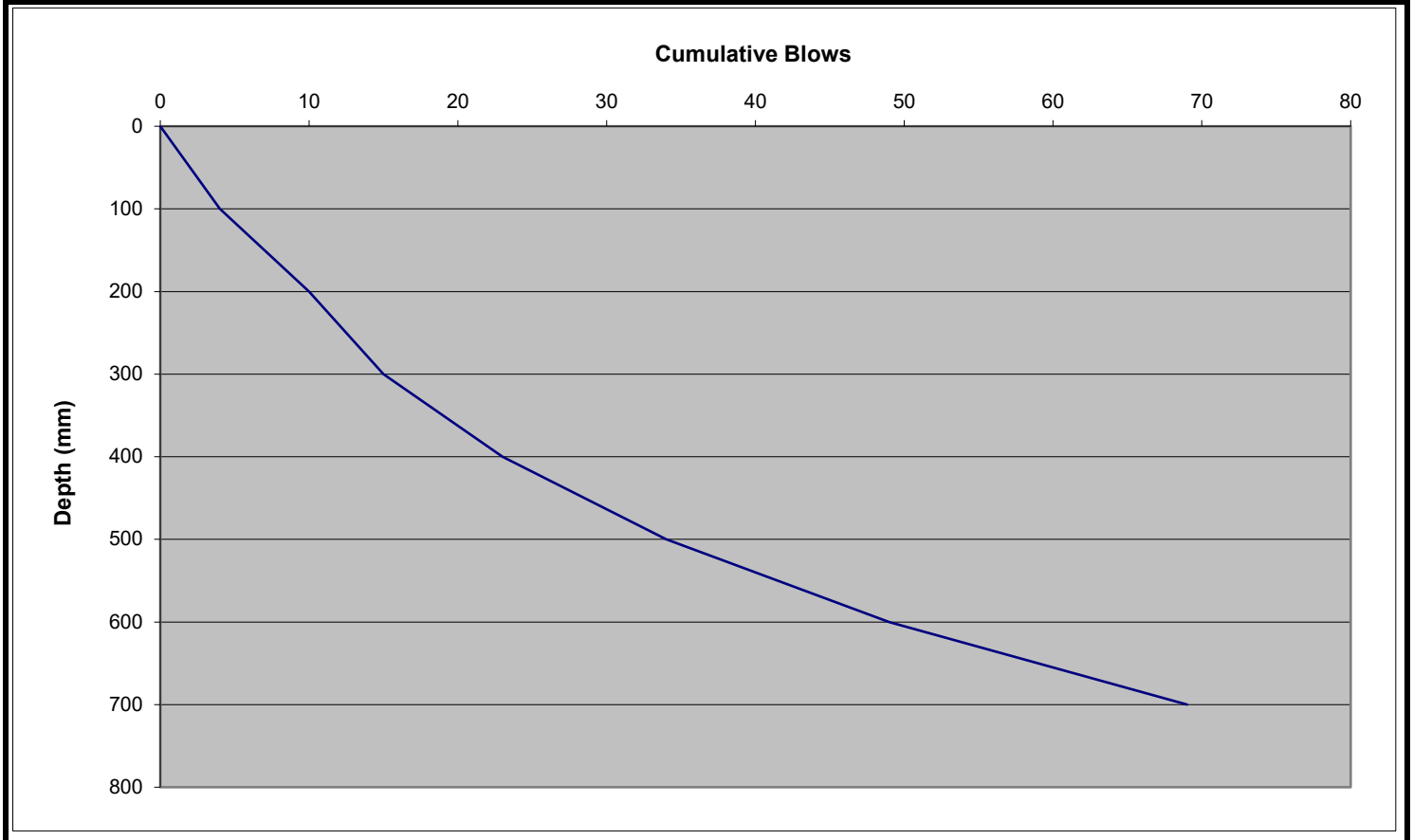
DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 3 OF: 10 ***DCP: 3 (BH2)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **S23-159**
PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): NIL
SOIL DESCRIPTION: REFER TO 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	4	7	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	6	12	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	8	17	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	11	25	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	15	38	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	20	55	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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REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 20/06/2023

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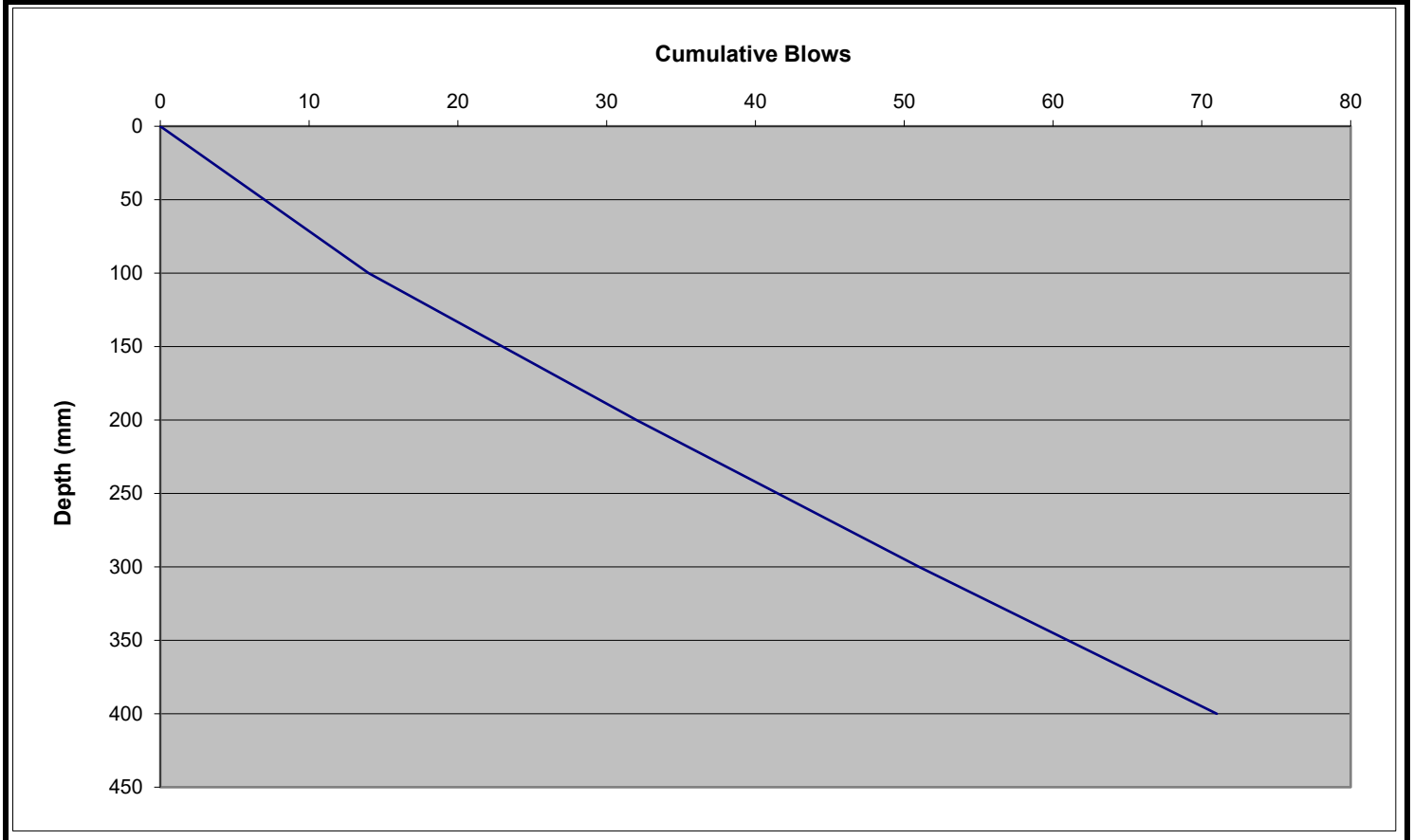
DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 4 OF: 10 ***DCP: 4 (BH2)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	REGISTRATION NO: **S23-159**
	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): 900
SOIL DESCRIPTION: REFER TO 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	14	35	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	18	48	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	19	51	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	20	55	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	END	*	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	*	*	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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REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 20/06/2023

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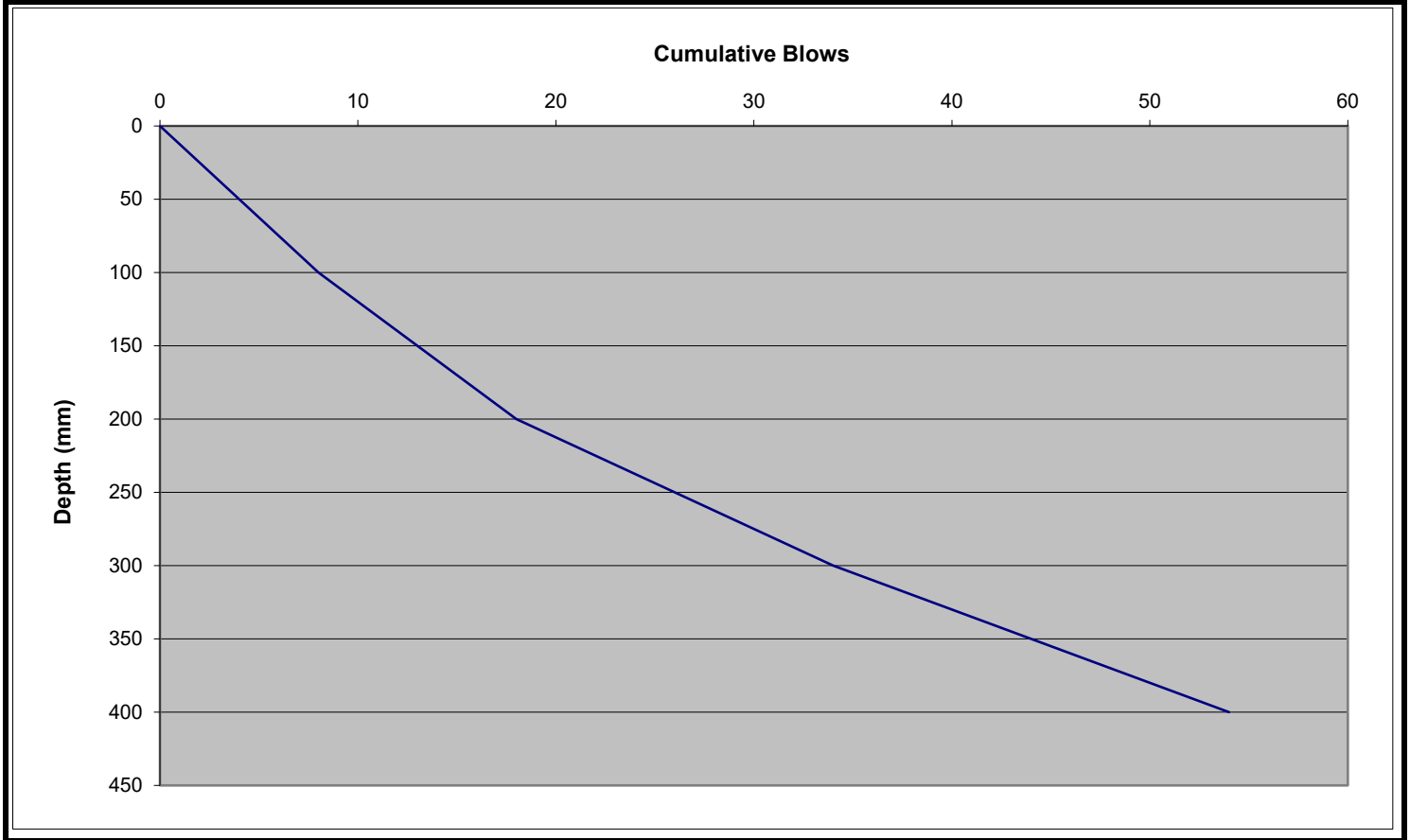
DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 5 OF: 10 ***DCP: 5 (BH3)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	REGISTRATION NO: **S23-159**
	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): NIL
SOIL DESCRIPTION: REFER TO 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	8	17	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	10	23	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	16	41	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	20	55	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	END	*	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	*	*	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: 20/06/2023

Aitken Rowe Testing Laboratories Pty Ltd

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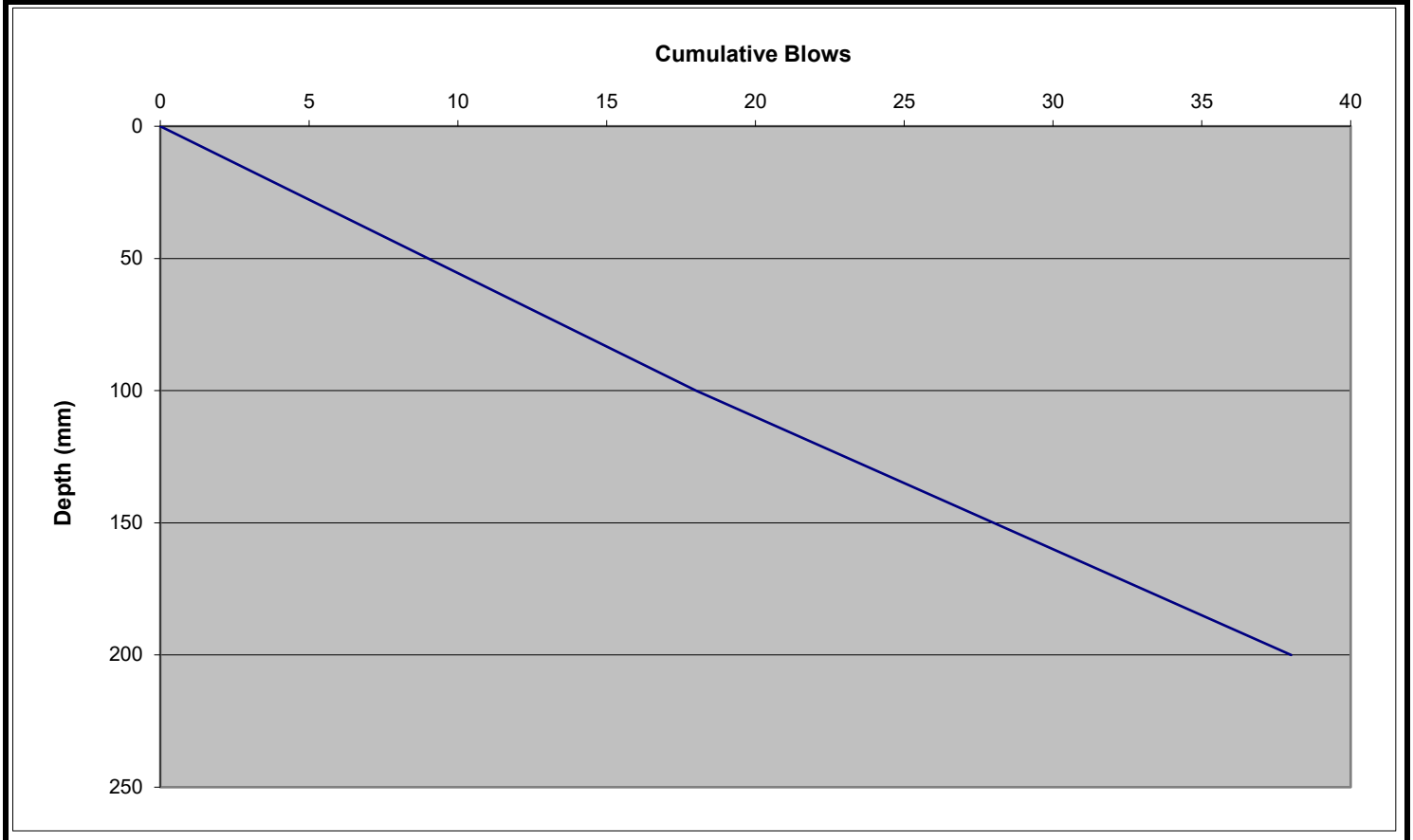
DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 6 OF: 10 ***DCP: 6 (BH3)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **S23-159**
PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): 900
SOIL DESCRIPTION: REFER TO 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	18	48	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	20	55	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	END	*	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	*	*	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	*	*	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	*	*	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	*	*



NATA
WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 20/06/2023

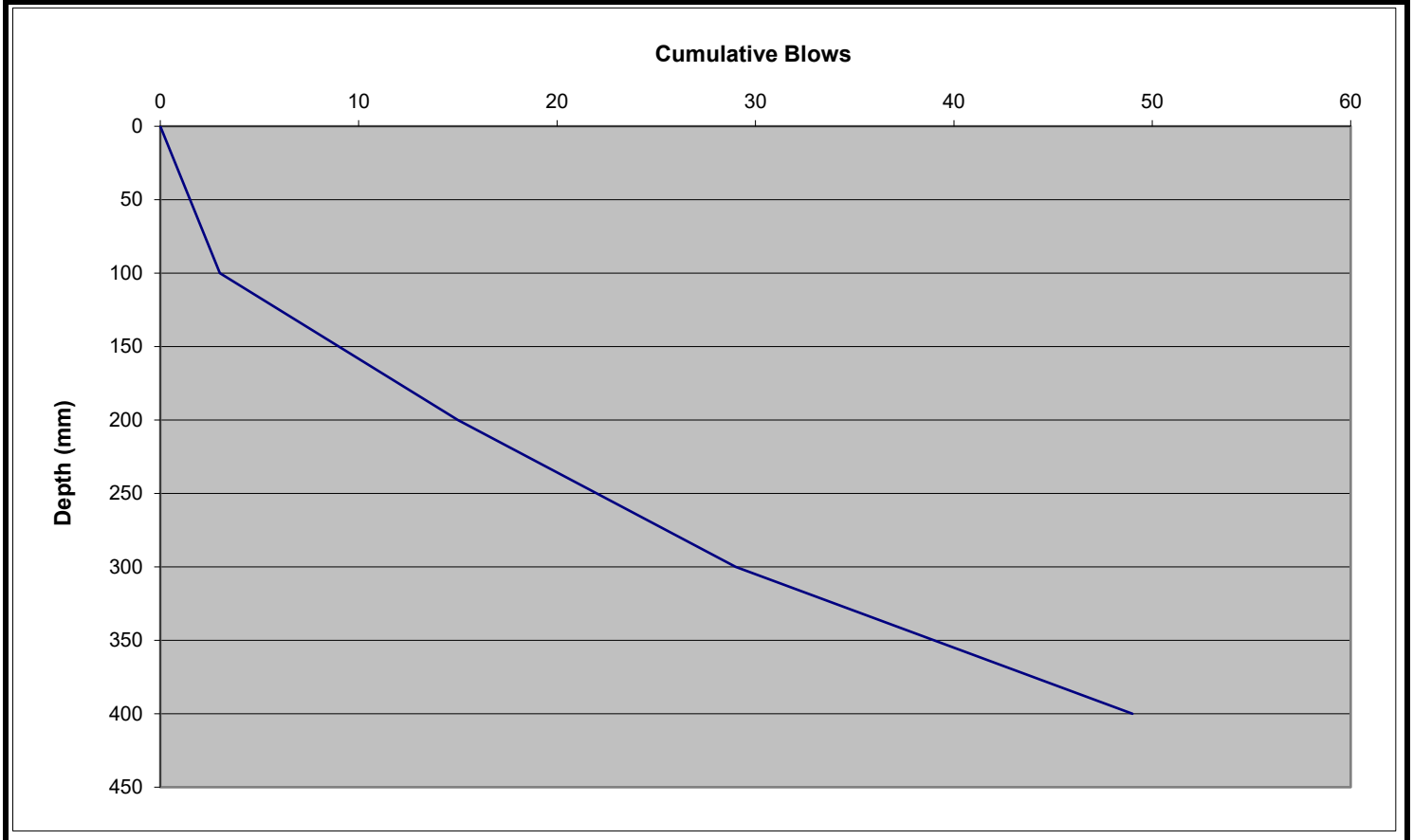
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Wagga: 4/2 Riedell Street, Wagga Wagga NSW 2650

DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 7 OF: 10 ***DCP: 7 (BH4)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	REGISTRATION NO: **S23-159**
	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): NIL
SOIL DESCRIPTION: REFER TO 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	12	28	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	14	35	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	20	55	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	END	*	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	*	*	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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WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 20/06/2023

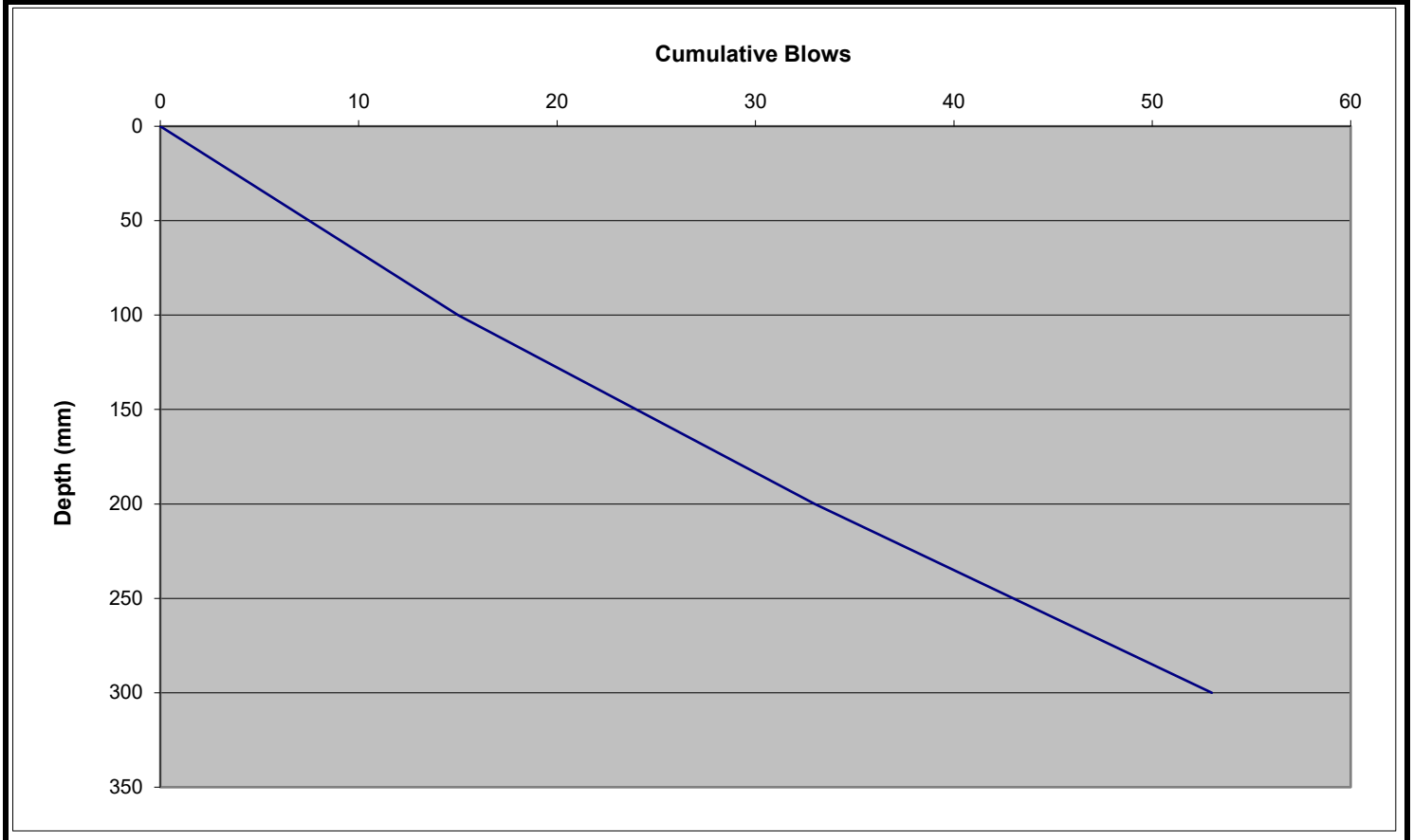
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Wagga: 4/2 Riedell Street, Wagga Wagga NSW 2650

DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 8 OF: 10 ***DCP: 8 (BH4)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **S23-159**
PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): 1000
SOIL DESCRIPTION: REFER TO 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	15	38	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	18	48	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	20	55	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	END	*	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	*	*	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	*	*	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: 20/06/2023

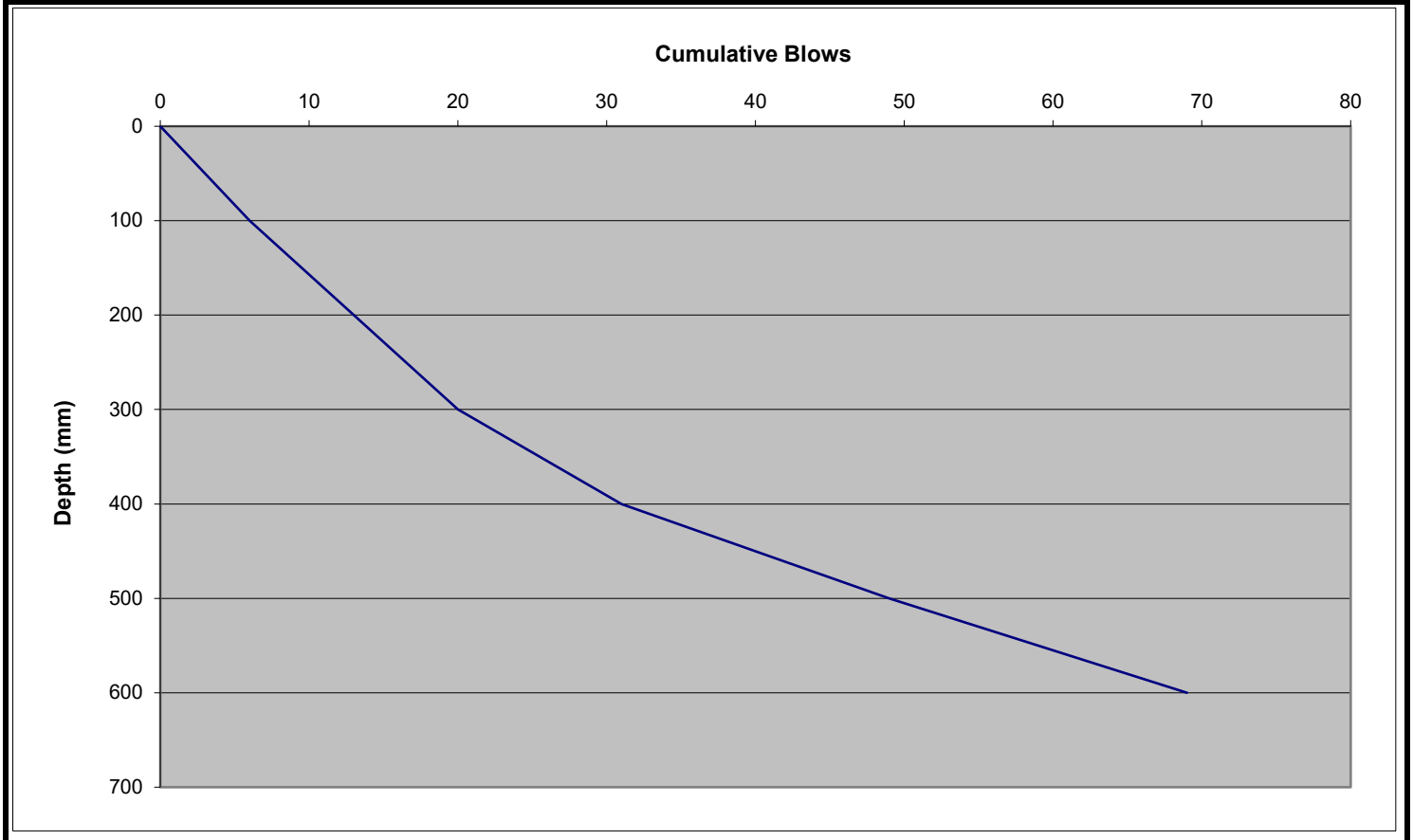
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Wagga: 4/2 Riedell Street, Wagga Wagga NSW 2650

DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 9 OF: 10 ***DCP: 9 (BH5)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN	REGISTRATION NO: **S23-159**
PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): NIL
SOIL DESCRIPTION: REFER TO 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	7	14	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	11	25	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	18	48	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	20	55	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: 20/06/2023

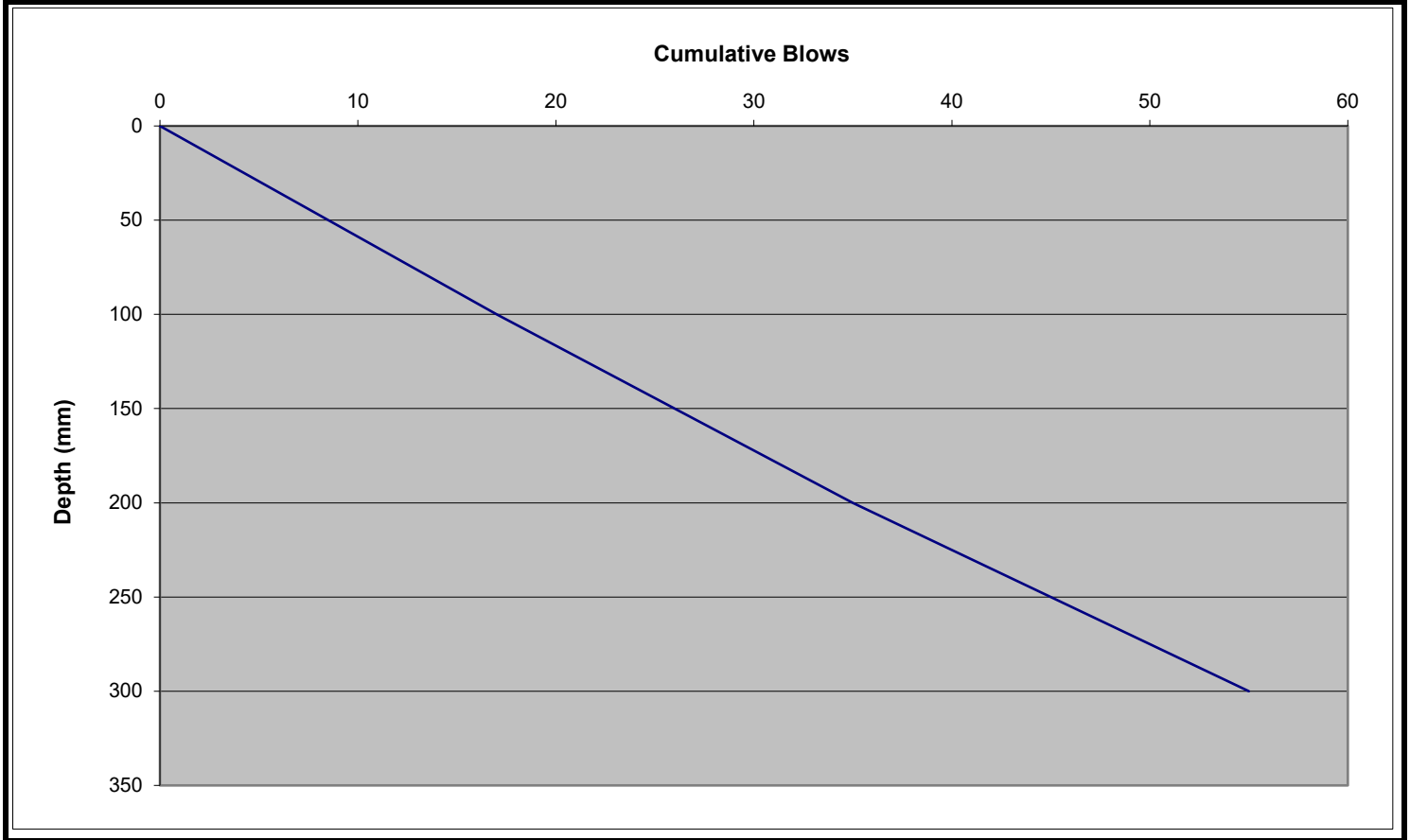
Aitken Rowe Testing Laboratories Pty Ltd

ARTL Wagga: 4/2 Riedell Street, Wagga Wagga NSW 2650

DYNAMIC CONE PENETROMETER REPORT

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW	PAGE: 10 OF: 10 ***DCP: 10 (BH5)***
PROJECT: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS,	REGISTRATION NO: **S23-159**
	DATE OF TEST: 9/05/2023
LOCATION: CENTERAL ROAD, WEST WYALONG, NSW	DEPTH BELOW ESL (mm): 1000
SOIL DESCRIPTION: REFER TO 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	17	44	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	18	48	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	20	55	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	END	*	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	*	*	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	*	*	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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Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 20/06/2023

AITKEN ROWE Testing Laboratories Pty Ltd

ARTL Wagga: 4/2 Riedell Street, Wagga Wagga NSW 2650

*

SAMPLED BY: ARTL
DATE SAMPLED: 9/05/2023
DATE SUBMITTED: 15/05/2023
SAMPLING METHOD: AS1289.1.2.1
SAMPLING CLAUSE: 6.5.3
DATES TESTED: 19-26/05/2023
ORDER No.: *

TEST REPORT: GEOTECHNICAL INVESTIGATION - SOIL ANALYSIS

CLIENT : BLAND SHIRE COUNCIL - WEST WYALONG, NSW
JOB DESCRIPTION : PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS, CENTRAL ROAD, WEST WYALONG, NSW
MATERIAL SOURCE : IN-SITU BOREHOLES | PROPOSED USE : DESIGN
MATERIAL TYPE : REFER TO MATERIALS SCHEDULE & LOG

REGISTRATION No : R28 **S23-159**

		SAMPLE NUMBER :	F1	SG1	SG2	SG2A	SG3	SG5
		SAMPLING LOCATION :	BH1	BH1	BH2	BH2	BH3	BH5
		DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm) :	60-300	300-600	100-400	400-600	100-400	100-300
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 %	*	*	*	*	*	100
		PASS 13.2mm SIEVE %	*	100	*	*	*	99
		PASS 9.50mm SIEVE %	*	99	*	*	*	99
		PASS 6.70mm SIEVE %	*	99	*	*	*	99
		PASS 4.75mm SIEVE %	*	99	*	*	100	99
		PASS 2.36mm SIEVE %	*	99	*	100	98	98
AS1141.19	WHOLE SAMPLE	PASS 425 µm SIEVE %	*	85	*	91	81	88
		PASS 75 µm SIEVE %	*	65	*	77	58	66
		LESS THAN 13.5 µm %	*	48	*	65	41	48
AS1141.19	-2.36mm	PASS 425 µm SIEVE %	*	86	*	91	82	90
		PASS 75 µm SIEVE %	*	65	*	77	60	67
		LESS THAN 13.5 µm %	*	49	*	65	42	49
		OBSERVATIONS	*	*	*	*	*	*
AS1289.3.1.2		LIQUID LIMIT %	*	44	*	65	33	36
AS1289.3.2.1		PLASTIC LIMIT %	*	19	*	16	16	18
AS1289.3.3.1		PLASTICITY INDEX	*	25	*	49	17	18
		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	*	1.66	*	*	1.82	1.63
(NOT DRY PREPPED)		OPTIMUM MOISTURE CONTENT %	*	19.4	*	*	13.9	20.0
		OVERSIZE MATERIAL % RETAINED ON 19.0mm	*	0	*	*	0	0
		LL METHOD OF CURING TIME DETERMINATION	*	VISUAL	*	*	VISUAL	VISUAL
		CURING DURATION HOURS	*	*	*	*	*	*
AS1289.3.4.1		LINEAR SHRINKAGE %	*	*	*	*	*	*
(PREP-AIR DRIED)		LENGTH OF MOULD mm	*	*	*	*	*	*
		CRACKING (CA), CRUMBLING (CR) OR CURLING (CU) OCCURRED	*	*	*	*	*	*
AS1289.2.1.1		FIELD MOISTURE CONTENT %	7.9	14.0	15.6	18.2	7.1	11.2

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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 : ..... DATE: 20/06/2023

Jarrod Gornall

AITKEN ROWE Testing Laboratories Pty Ltd

ARTL Wagga: 4/2 Riedell Street, Wagga Wagga NSW 2650

*

SAMPLED BY: ARTL
DATE SAMPLED: 9/05/2023
DATE SUBMITTED: 15/05/2023
SAMPLING METHOD: AS1289.1.2.1
SAMPLING CLAUSE: 6.5.3
DATES TESTED: 19-26/05/2023
ORDER No.: *

TEST REPORT: GEOTECHNICAL INVESTIGATION - SOIL ANALYSIS

CLIENT : BLAND SHIRE COUNCIL - WEST WYALONG, NSW
JOB DESCRIPTION : PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS, CENTRAL ROAD, WEST WYALONG, NSW

MATERIAL SOURCE : IN-SITU BOREHOLES | PROPOSED USE : DESIGN
MATERIAL TYPE : REFER TO MATERIALS SCHEDULE & LOG

REGISTRATION No : R28 **S23-159**

		SAMPLE NUMBER :	SG5A	*	*	*	*	*
		SAMPLING LOCATION :	BH5	*	*	*	*	*
		DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm) :	300-500	*	*	*	*	*
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 %	86	*	*	*	*	*
		PASS 75 µm SIEVE %	61	*	*	*	*	*
		LESS THAN 13.5 µm %	41	*	*	*	*	*
AS1141.19	-2.36mm	PASS 425 µm SIEVE %	86	*	*	*	*	*
		PASS 75 µm SIEVE %	61	*	*	*	*	*
		LESS THAN 13.5 µm %	41	*	*	*	*	*
		OBSERVATIONS	*	*	*	*	*	*
AS1289.3.1.2		LIQUID LIMIT %	49	*	*	*	*	*
AS1289.3.2.1		PLASTIC LIMIT %	19	*	*	*	*	*
AS1289.3.3.1		PLASTICITY INDEX	30	*	*	*	*	*
		PREPARATION METHOD	AS1289.1.1-5.3	*	*	*	*	*
AS1289.5.1.1 (NOT DRY PREPPED)		STANDARD MAX. DRY DENSITY t/m^3	*	*	*	*	*	*
		OPTIMUM MOISTURE CONTENT %	*	*	*	*	*	*
		OVERSIZE MATERIAL % RETAINED ON 19.0mm	*	*	*	*	*	*
		LL METHOD OF CURING TIME DETERMINATION	*	*	*	*	*	*
		CURING DURATION HOURS	*	*	*	*	*	*
AS1289.3.4.1 (PREP-AIR DRIED)		LINEAR SHRINKAGE %	*	*	*	*	*	*
		LENGTH OF MOULD mm	*	*	*	*	*	*
		CRACKING (CA), CRUMBLING (CR) OR CURLING (CU) OCCURRED	*	*	*	*	*	*
AS1289.2.1.1		FIELD MOISTURE CONTENT %	16.8	*	*	*	*	*

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 : ..... DATE: 20/06/2023

Jarrod Gornall

AITKEN ROWE Testing Laboratories Pty Ltd

ARTL Wagga Wagga: 4/2 Riedell Street, Wagga Wagga NSW 2650

TEST REPORT

CALIFORNIA BEARING RATIO OF SOILS AND GRAVELS

CLIENT: BLAND SHIRE COUNCIL - WEST WYALONG, NSW

JOB DESCRIPTION: PAVEMENT & SUBGRADE INVESTIGATION & PAVEMENT DESIGN - PROPOSED WEST WYALONG BUSINESS PARK SUBDIVISION & STREET LIGHTS, CENTRAL ROAD, WEST WYALONG, NSW

SOURCE OF MATERIAL: IN-SITU BOREHOLES

PROPOSED USE: PAVEMENT DESIGN

SAMPLED BY: ARTL

DATE SAMPLED: 9/05/2023

DATE RECEIVED: 15/05/2023

TESTING COMMENCED: 18/05/2023

TESTING COMPLETED: 3/06/2023

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

REGISTRATION NO : R6 **S23-159**

SAMPLE NO:	SG1	SG3	SG5	*	*
SITE OR LOCATION	BH1	BH3	BH5	*	*
DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm)	400-600	100-300	100-300	*	*
ADDITIVE IF STABILISED	N/A	N/A	N/A	*	*
AMOUNT OF ADDITIVE (%)	N/A	N/A	N/A	*	*
TYPE OF COMPACTION (Standard/Modified)	STANDARD	STANDARD	STANDARD	*	*
MATERIAL RETAINED ON THE 19.0mm SIEVE (%)	0.0	0.0	0.0	*	*
OPTIMUM MOISTURE CONTENT (%)	19.4	13.9	20.0	*	*
MAXIMUM DRY DENSITY (t/m^3)	1.66	1.82	1.63	*	*
MOULDING MOISTURE CONTENT (%)	19.1	13.8	19.9	*	*
DRY DENSITY OF TEST SPECIMEN (t/m^3)	1.58	1.74	1.56	*	*
SPECIFIED LDR (%)	95	95	95	*	*
ACTUAL LDR (%)	95	96	95	*	*
MOISTURE CONTENTS : TOP 30 mm	25.8	18.8	29.3	*	*
WHOLE SAMPLE	22.9	17.8	25.1	*	*
ABSORPTION (%)	3.8	4.0	5.3	*	*
SPECIFIED LMR (%)	100	100	100	*	*
ACTUAL LMR (%)	98	99	99	*	*
NUMBER OF DAYS SOAKING	10	10	10	*	*
SWELL (%)	0.9	1.5	1.8	*	*
CBR OBTAINED FROM PENETRATION (mm)	2.5	2.5	2.5	*	*
CALIFORNIA BEARING RATIO (%)	**4.5**	**6**	**4.5**	*	*

NOTES: *

*

COMMENTS: *

NATA

WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER:

APPROVED SIGNATORY: Jarrod Gornall

DATE: 20/06/2023

AITKEN ROWE TESTING LABORATORIES PTY LTD

DESIGN TRAFFIC CALCULATION

Reg. No.: **S23-159**

Project: **Proposed West Wyalong Business Park Subdivision & Street Lights, Central Road, West Wyalong, NSW**

1. AADT:	400
2. HV%:	25.0
3. Direction Factor (DF):	0.5
4. Lane Distribution Factor (LDF):	1.0
5. Design Life (Years)	40
6. Growth Rate:	7.5%
7. Cumulative Growth Factor (CGF)	227.26
8. Average number of axle groups per Heavy Vehicle (Nhvag):	2.8
9. ESA/HVAG:	1.037
10. Use of Design Lane %	100.0

Ni=AADTxDFx%HV/100xLDF

Ni=Initial Daily Heavy Vehicles trasversing the design lane

Ni= 50 HVs

Nhv=365xCGFxNi

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

Nhv= 4.15E+06 HVs

Ndt=NhvxNhvag

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

Ndt= 1.16E+07 HVAGs

DESA=(ESA/HVAG)*Ndt

DESA=Design number of Equivalent Standard Axles of traffic loading

DESA= 1.20E+07

CIRCLY - Version 7.0 (7 November 2022)

Job Title: S23-159 Proposed West Wyalong Business Park Subdivision & Street Lights, Cental Road, West Wyalong, NSW

Design Method: Austroads 2017

NDT (cumulative heavy vehicle axle groups over design period): 1.16E+07

Traffic Load Distribution:

ID: NSWPresumeUrban
Name: NSW RMS Aug 2018 - Urban Presumptive (Table 17)
ESA/HVAG: 1.037

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: S23-159 Title: Proposed Business Park Subdivision, Central Road, West Wyalong, NSW

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_150	Aniso.	1.50E+02	0.35	1.11E+02	7.50E+01	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):	8.883E-04

Results:

Layer No.	Thickness	Material ID	Axle Group	CDF
1	250.00	Gran_350		n/a
2	320.00	Gran_150		n/a
3	0.00	Sub_CBR4	Total:	9.779E-01

CIRCLY - Version 7.0 (7 November 2022)

Job Title: S23-159 Proposed West Wyalong Business Park Subdivision & Street Lights, Cental Road, West Wyalong, NSW

Design Method: Austroads 2017

NDT (cumulative heavy vehicle axle groups over design period): 1.16E+07

Traffic Load Distribution:

ID: NSWPresumeUrban
Name: NSW RMS Aug 2018 - Urban Presumptive (Table 17)
ESA/HVAG: 1.037

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: S23-159 Title: Proposed Business Park Subdivision, Central Road, West Wyalong, NSW

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_250	Aniso.	2.50E+02	0.35	1.85E+02	1.25E+02	0.35
2	rough	Gran_150	Aniso.	1.50E+02	0.35	1.11E+02	7.50E+01	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):	8.849E-04

Results:

Layer No.	Thickness	Material ID	Axle Group	CDF
1	250.00	Gran_250		n/a
2	340.00	Gran_150		n/a
3	0.00	Sub_CBR4	Total:	9.519E-01

CIRCLY - Version 7.0 (7 November 2022)

Job Title: S23-159 Proposed West Wyalong Business Park Subdivision & Street Lights, Cental Road, West Wyalong, NSW

Design Method: Austroads 2017

NDT (cumulative heavy vehicle axle groups over design period): 1.16E+07

Traffic Load Distribution:

ID: NSWPresumeUrban
Name: NSW RMS Aug 2018 - Urban Presumptive (Table 17)
ESA/HVAG: 1.037

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: S23-159 Title: Proposed Business Park Subdivision, Central Road, West Wyalong, NSW

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_150	Aniso.	1.50E+02	0.35	1.11E+02	7.50E+01	0.35
3	rough	subsltCB10	Aniso.	1.00E+02	0.45	6.90E+01	5.00E+01	0.45
4	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	subsltCB10	EZZ	0.009150	7.000	
4	top	Sub_CBR4	EZZ	0.009150	7.000	

Reliability Factors:
Project Reliability: Austroads 95%

Layer No.	Reliability Factor	Material Type
3	1.00	Subgrade (Selected Material) (Austroads 2017)
4	1.00	Subgrade (Austroads 2017)

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering
Layer no. 3: Austroads (2004) sublayering

Strains:

Layer No.	Thickness	Material ID	Axle	Unitless Strain
3	300.00	subsltCB10	SADT(80):	8.948E-04
4	0.00	Sub_CBR4	SADT(80):	7.976E-04

Results:

Layer No.	Thickness	Material ID	Axle Group	CDF
1	160.00	Gran_350		n/a
2	170.00	Gran_150		n/a
3	300.00	subsltCB10	Total:	1.029E+00
4	0.00	Sub_CBR4	Total:	4.603E-01

CIRCLY - Version 7.0 (7 November 2022)

Job Title: S23-159 Proposed West Wyalong Business Park Subdivision & Street Lights, Cental Road, West Wyalong, NSW

Design Method: Austroads 2017

NDT (cumulative heavy vehicle axle groups over design period): 1.16E+07

Traffic Load Distribution:

ID: NSWPresumeUrban
Name: NSW RMS Aug 2018 - Urban Presumptive (Table 17)
ESA/HVAG: 1.037

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: S23-159 Title: Proposed Business Park Subdivision, Central Road, West Wyalong, NSW

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	subsltCB10	Aniso.	1.00E+02	0.45	6.90E+01	5.00E+01	0.45
4	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	subsltCB10	EZZ	0.009150	7.000	
4	top	Sub_CBR4	EZZ	0.009150	7.000	

Reliability Factors:
Project Reliability: Austroads 95%

Layer No.	Reliability Factor	Material Type
3	1.00	Subgrade (Selected Material) (Austroads 2017)
4	1.00	Subgrade (Austroads 2017)

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering
Layer no. 3: Austroads (2004) sublayering

Strains:

Layer No.	Thickness	Material ID	Axle	Unitless Strain
3	300.00	subsltCB10	SADT(80):	8.909E-04
4	0.00	Sub_CBR4	SADT(80):	8.036E-04

Results:

Layer No.	Thickness	Material ID	Axle Group	CDF
1	170.00	Gran_200		n/a
2	170.00	Gran_200		n/a
3	300.00	subsltCB10	Total:	9.982E-01
4	0.00	Sub_CBR4	Total:	4.848E-01

Aitken Rowe
GEOTECHNICAL ENGINEERING

Geotechnical Engineering
Environmental Consultancy
Soil Concrete Aggregate Testing
NATA Accredited Laboratories

ABN 53 058 315 138 ACN 058 315 138

Essential Energy Street Lighting Footing Compliance

We certify that the soil profile encountered at the proposed West Wyalong Business Park subdivision at Lots 1133, 1233, 1243 and 1257, DP 753135, Central Road, West Wyalong, NSW meets the minimum requirements of Essential Energy's Standard Streetlight Footing Details as described in Essential Energy's "Standard Streetlight Footing Details -CEOM7206.04" at the borehole locations drilled (BH1 to BH5) within the investigation depth of 4.0m (termination depth) at the time of the investigation.

It is noted that the proposed street light footings are to be founded at a minimum depth of 1.6m below the existing surface level as per CEOM7206.04.

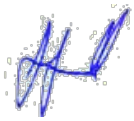
The foundation material at the depth of **1.6m and below** existing site level at the subject generally varies from extremely weathered and highly weathered siltstone bedrock with the unit weight of 20.0 to 21.0kN/m^3 and angle of friction (ø) of 38 to 40^o as per our Geotechnical Report No. S23-159, dated 27 June 2023.

We confirm that the design parameters given in our report, S23-159, dated 27 June 2023, meet the minimum design requirements for the footings as described in "CEOM7206.04" at the depth of 1.6m and below at the location of BH1 to BH5 (refer to our Geotechnical Investigation Report No. S23-159, dated 27 June 2023).

We confirm we are suitably qualified Geotechnical Engineers.

Name: Jarrod Gornall

Signature:



Date: 27 June 2023