08 April 2026

Clean Energy Link - North

T0621770: NBT – MUL WGA Double Circuit

GEOTECHNICAL INVESTIGATION REPORT

Acciona Construction Australia Pty Ltd

Job No. PER2025-0250AF | Version 0

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Version Control

Document version information	
Job number	PER2025-0250AF
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Review and Update History

Revision	Date	Comments
0	08 April 2026	Issue to client

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1.0 INTRODUCTION

1.1 General

CMW Geosciences (CMW) was engaged by Acciona Construction Australia Pty Ltd (Acciona) to carry out a geotechnical investigation for a proposed new transmission line located between the northern Perth suburbs of Pinjar and Wangara. The package forms part of the wider Western Power Clean Energy Link North (CELN) Project, which aims to upgrade the northern region of the Southwest Interconnected Network to enable future connection of large-scale renewable energy.

This report is specific to the **T0621770 – NBT – MUL WGA Double Circuit** package.

Reporting for other packages is provided under separate covers, referenced below:

- **T0621767 – Padbury to Wangara 132kV Underground Cable Route**
    - CMW Report ref. PER2025-0250AB Rev 1, dated 164 December 2025
- **T0621493 – NT – NOR HBK Tee off – 132kV Transmission Line**
    - CMW Report ref. PER2025-0250AC Rev 0, dated 08 December 2025

The scope of work and associated terms and conditions of our engagement were detailed by way of executed contract (Ref. Contract No. N-7.20.N.EN.S.13, dated 15 September 2025).

2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 Alignment Route

The T0621770 – NBT – MUL WGA Double Circuit package (herein referred to as the “*Double Circuit*”) is located within Perth’s northern suburbs and involves the construction of an overhead transmission line connecting the Neerabup Terminal in Pinjar to a transition structure at the intersection of Wanneroo Road and Ocean Reef Road.

The alignment route is approximately 23 km long and requires the installation of 175 electrical poles. For the purposes of this report we have adopted a chainage system, commencing at Neerabup Terminal (CH 0 m) and terminating at the transition structure (approx. CH 23,250 m). The route can generally be divided into the following geographical sections:

2.1.1 Section 1: Neerabup Terminal to Bardie Road

Section 1 extends from CH 0 m to CH 1,800 m. It comprises an area of rural land between Neerabup Terminal (CH 0 m) and the intersection of Skink Road and Bardie Road (CH 1,800 m). This section of the alignment is shared by an existing overhead transmission line for which Acciona have acquired existing geotechnical investigation data. We understand that Acciona is relying upon this information for now, and for this reason Section 1 has not been investigated as part of this scope and is not covered within this report.

2.1.2 Section 2: Bardie Road to Mulga Road

Section 2 extends from CH 1,800 m to CH 8,550 m. It commences at Bardie Road, following the alignment south towards Neaves Road. The alignment continues in the south to south-east direction along Neaves Road, Boundary Road, Townsend Road, and Hawkins Road, before turning east at Mulga Road.

The site conditions of Section 2 comprise flat to gently undulating rural land with a mix of open, lightly vegetated area, and dense, forested areas.

The topography and site levels through Section 2 are relatively uniform with only minor undulations. Surface levels generally decrease in the south direction from RL 56.5 m AHD in the north to RL 53.5 m AHD in the south, with local variations as high as RL 62 m AHD in the north and as low as RL 49 m AHD in the south.

2.1.3 Section 3: Mulga Road to Sydney Road

Section 3 extends from CH 8,550 m to CH 14,550 m. It commences at Mulga Road, following a limestone access track to the east before turning south at CH 10,450 m. The route then follows a network of unsealed roads, 4WD tracks, and fire breaks towards Joyce Road in the south, then turning west along Joyce Road towards the intersection of Joyce Road and Sydney Road.

The site conditions and land use are like those of Section 2, comprising a mix of lightly vegetated, undeveloped rural areas and forestry blocks. The section along Joyce Road is more developed, comprising a mix of rural-residential and small scale agriculture.

The overall grade of Section 3 remains flat to gently sloping, although it is differentiated from Section 2 by localised areas of higher relief with several hills and moderate slopes present along the section. Site levels are therefore variable, ranging between RL 52.0 m AHD and RL 76.5 m AHD.

2.1.4 Section 4: Sydney Road

Section 4 extends from CH 14,550 m to CH 17,900 m. It follows Sydney Road, heading south towards the intersection of Sydney Road and Ocean Reef Road.

The site conditions along this section comprise public road reserve which passes through a mix of rural residential, lifestyle, and small-scale agricultural blocks, with some light industrial area in the south near Gnangara Lake.

Topography through Section 4 is characterised by an area of relatively low relief, gently reducing from RL 52 m AHD at the intersection of Joyce Road, to a lowest point of RL 44 m AHD near Gnangara Lake, then gently increasing to RL 47 m AHD at the intersection of Sydney Road and Ocean Reef Road.

2.1.5 Section 5: Ocean Reef Road

Section 5 extends from CH 17,900 m to CH 23,250 m. It follows Ocean Reef Road from the intersection of Sydney Road through to the termination point of the alignment at Wanneroo Road.

The alignment follows the road reserve of Ocean Reef Road through an area of mixed commercial and light industrial area. Some light agriculture is located to the north of Ocean Reef Road.

Topography through this section is characterized by an increase in relief, with ground levels generally increasing from RL 46 m AHD at the intersection of Sydney Road and Ocean Reef Road, towards a high point of the site of RL 79 m AHD at approximately CH 21,250 m. From this point the site levels drop moderately steeply towards the lowest point of the site, RL 30 m AHD at the end of the alignment.

The alignment route is shown in Figure 1 below.

Figure 1: Proposed Alignment Route

For illustrative purposes, a cross section of the alignment has been generated from Google Earth showing the general topography of the alignment and is reproduced in Figure 2. Significant vertical exaggeration has been applied.

Figure 2: Proposed Alignment Section

2.2 Proposed Foundations

We understand that the transmission line will be supported by steel pole structures founded upon a single bored pile of approximately 1.8 - 2.0 m diameter, subject to further detailed design. We understand the client is not considering shallow foundations.

3.0 DESKTOP STUDY

3.1 Geological Setting

The site is situated on the Swan Coastal Plain approximately halfway between the Darling Ranges and Perth's west coast. The geology and geomorphology of the site is presented on the "Perth" and "Muchea" sheets of the Geological Society of Western Australia (GSWA) 1:50,000 Environmental Geology Series (Gozzard, 1986).

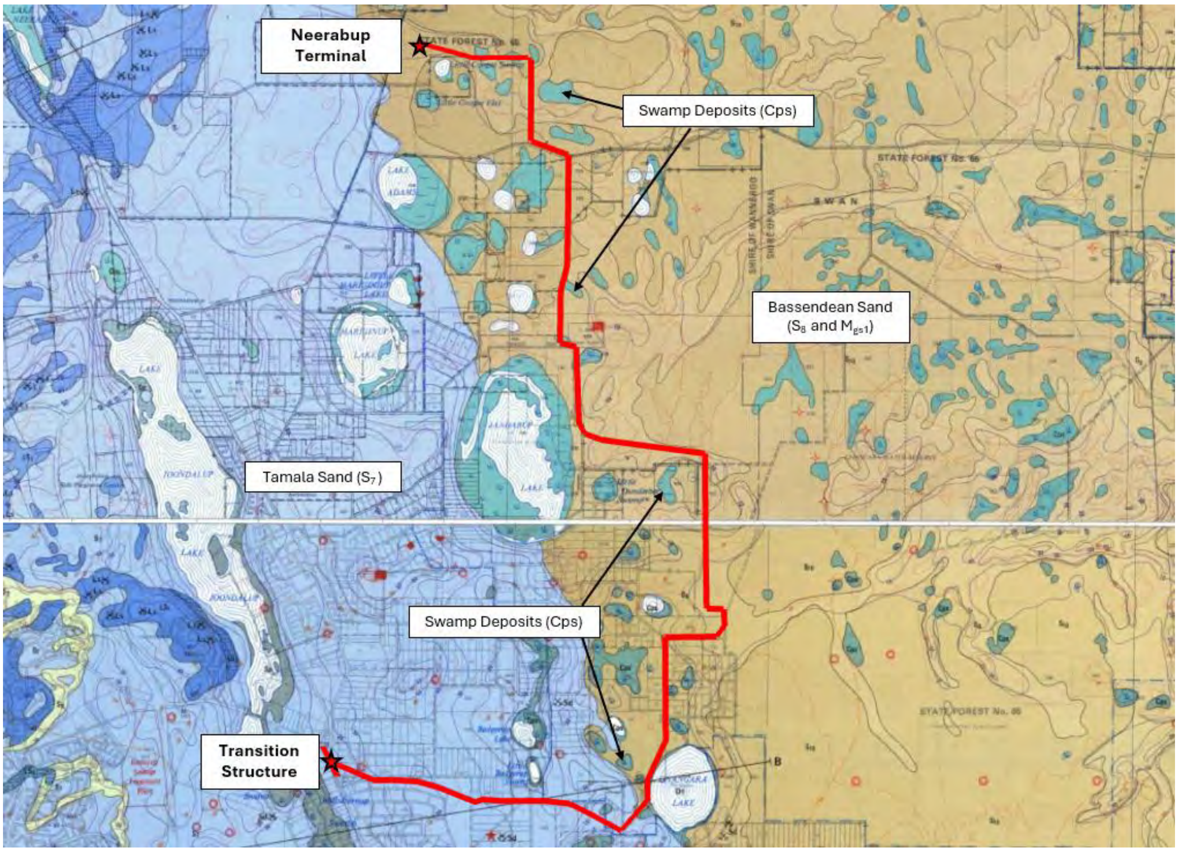
The surficial geology across the alignment is mapped to contain a combination of Sands Derived from Tamala Limestone, and Bassendean Sand. Localised swamp deposits are mapped sporadically across the alignment:

- **Sands Derived from Tamala Limestone (S_7):** SAND – pale and olive yellow, medium to coarse-grained, sub-angular quartz and a trace of feldspar, moderately sorted, of residual origin,
- **Tamala Limestone (LS_1):** Limestone – light, yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of aeolian origin,
- **Bassendean Sand (S_8):** SAND – very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin,
- **Thin Bassendean Sand over Guildford Formation (S_{10}):** SAND – as S_8, overlying M_{gs1} (Guildford Formation),
- **Swamp Deposits (Cps):** PEATY CLAY – dark grey and black with variable sand content, of lacustrine origin.

Considering the location of the site (outer Perth metro area) and the proximity of the alignment to areas of existing development and infrastructure, it is likely that fill deposits will be widely encountered along the alignment.

The anticipated geological conditions are proposed in Figure 3.

Figure 3: Geology Map - GSWA 1:50,000 Environmental Series "Perth" and "Muchea" Sheets (Gozzard 1986)



3.2 Groundwater

The Perth Groundwater Atlas suggests that the elevation of the groundwater surface is relatively flat across most of the site, ranging from RL 48.2 m AHD at the northern point of Bardie Road, steadily decreasing to RL 41.0 m AHD at CH 20,500 m. Localised fluctuations in the groundwater surface exist in areas with variable topography, however these are limited to short sections, and overall the elevation of groundwater surface through this area does not vary significantly.

From approximately CH 20,500 m onwards, the groundwater surface begins to drop at a steeper gradient, roughly following the downwards sloping topography towards RL 27.0 m AHD at the end of the alignment (CH 23,250 m).

Although the elevation of the groundwater surface is relatively linear across the site, the actual depth of groundwater from the ground surface is more variable due to changes in surface levels across the site. Depths to groundwater according to the 2019 dataset of the atlas generally range from as shallow as 3.0 m bgl near Gnangara Lake to as deep 36.5 m bgl at points along Ocean Reef Road. Groundwater is typically present within the upper 10 m profile over most of the alignment.

3.3 Acid Sulfate Soils

The Acid Sulfate Soils (ASS) Risk Map for the Swan Coastal Plain indicates a range of “Low Probability” to “High Probability” for the presence of Acid Sulfate Soils across the site.

In general, Tamala Sand is expected to have a low risk for ASS, Bassendean Sand is expected to have a medium risk of ASS, and swamp deposits or areas around lakes and wetlands are expected to have a high risk of ASS.

4.0 FIELD INVESTIGATION

4.1 General

The geotechnical site investigation for the Double Circuit was undertaken by CMW between 21 January 2026 and 24 February 2026. The scope of investigation works included machine boreholes, cone penetration testing, and *in situ* electrical resistivity testing.

All fieldwork was caried out under the direction of Geotechnical Engineers and Engineering Geologists from CMW in accordance with AS1726-2017 – Geotechnical Site Investigations.

The scope of the site investigation works undertaken is summarised below:

- Drilling of 39 No. boreholes to target depths of between 13 m and 15 m bgl using a combination of Direct Push Probe (DPP) and HQ3 diamond coring techniques.
  - Installation of 5 No. standpipe piezometer monitoring wells within selected boreholes.
  - Collection of representative soil samples for laboratory testing from within the boreholes.
- Advancement of 121 No. Piezocone Penetration Tests to terminal depths of between 3.8 m and 15 m bgl.
- Soil electrical resistivity testing at 9 locations.

All locations were selected, set out, and services cleared by Acciona prior to any intrusive works taking place.

Investigation locations are presented on the Site Investigation Plan provided in Appendix A.

4.2 Borehole Drilling

Thirty-nine (39) boreholes drilled to target depths of 15 m using a Geoprobe 7822DT geotechnical drilling rig supplied and operated by National Geotech Pty Ltd. A combination of Direct Push Probe (DPP) and diamond coring (HQ3) drilling techniques were utilised. Standard penetration tests (SPT) were conducted in all boreholes in accordance with AS1289.6.3.1 at 1.5 m depth intervals.

DPP was the preferred drilling method and was used in most boreholes. HQ3 coring was used when DPP refusal was encountered prior to the target depth or, in locations where DPP refusal was expected (e.g. a known presence of nearby limestone). In some cases, DPP refusal was encountered just short of target depth, and, instead of changing to HQ3, the borehole was extended using back-to-back SPT techniques.

All core was placed in PVC splits and metal core trays before being photographed. Individual splits were wrapped in plastic sleeves (lay-flat) to maintain the sample integrity and moisture content. Boreholes were logged in accordance with AS1726-2017 (Geotechnical Site Investigations).

Engineering logs of the boreholes and core photographs are presented in Appendix B. Borehole details including location ID, spatial data, and termination information are provided in Table B.1 at the front of Appendix B.

4.3 Groundwater Monitoring Well Installation

Groundwater monitoring wells were installed in five of the boreholes across the site. Monitoring wells comprise 50mm (ID) solid PVC pipe with machine slotted PVC pipe in the expected response zone (base of the well) – refer to Table 1 below for well details. The monitoring wells were backfilled with gravel to 1 m bgl, plugged with a 1 m thick bentonite seal, and sealed at the surface with a monument well cover and grout/bentonite mix. The monitoring well was developed using a submersible pump following installation of each monitoring well to clear the drill muds from the borehole.

Table 1: Summary of Monitoring Well Details

Location ID	Approximate Chainage	Well Depth (m bgl)	Screened Depth (m bgl)	Screened Formation
BH21	CH 2,450 m	14.0	11.0 – 14.0	Bassendean Sand
BH53	CH 6,950 m	10.5	7.5 – 10.5	Bassendean Sand
BH77	CH 10,250 m	14.5	11.5 – 14.5	Bassendean Sand, duricrust
BH133	CH 17,900 m	9.0	6.0 – 9.0	Bassendean Sand, duricrust
BH165	CH 22,300 m	15.0	12.0 – 15.0	Tamala Sand

4.4 Cone Penetration Testing

One hundred and twenty-one (121) Piezocone Penetration Tests (CPT) were advanced to target depths of 15 m bgl using a 22-ton truck-mounted CPT rig supplied and operated by Probedrill. Where site access could not be obtained for the truck-mounted CPT rig, then an M1 Morooka tracked CPT rig was mobilised to complete these instead.

The majority of CPT testing reached the target depth – however CPT refusal was encountered in several locations as depths as shallow as 0.4 m bgl. Where shallow refusal was encountered, then the CPT was shifted approximately 1-2 m away from the initial attempt and reattempted up to two times.

Plots of CPT cone tip resistance, friction ratio, and pore pressure are presented in Appendix C. CPT details including location ID, spatial data, and termination information are provided in Table C.1 at the front of Appendix C.

4.5 Electrical Resistivity Testing

In situ soil electrical resistivity testing was undertaken at 9 locations (denoted EL01 to EL09) using a Sonel MRU-120HD earth resistance meter in accordance with the Wenner four-electrode method as described in AS1289.4.4.1-2017 and IEEE Standard 81-2012 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.

Two perpendicular transverses were undertaken at each location with electrode spacings of 0.25 m, 0.5 m, 1 m, 2 m, 4 m, 8 m, and 16 m.

Electrical resistances greater than 19.9kΩ were recorded in most tests, causing the instrument to return an error instead of a numerical resistivity value. These higher resistances are expected to be due to the loose, dry, sandy surface soil conditions preventing good ground connection with the electrodes.

Results of the tests and coordinates for the test locations (taken as the intersection point of perpendicular traverses) are provided in Table D.1 in Appendix D.

4.6 Laboratory Testing

A program of laboratory testing was undertaken on selected soil samples recovered from the boreholes. Testing was scheduled by CMW and carried out by Western Geotechnical & Laboratory Services – a NATA accredited testing laboratory located in Perth.

The following laboratory tests were scheduled and completed in accordance with the relevant Australian Standard, or other alternative standard where an Australian Standard does not exist. The testing standards are noted on the individual laboratory test certificates in Appendix E. The types of tests and quantities of testing was stipulated by Acciona.

A summary of the lab testing completed, and the associated test method is provided in Table 2. Geotechnical Laboratory test certificates are provided in Appendix E.

Table 2: Laboratory Testing Methods and Quantities

Laboratory Test	Test Method	Quantity
Particle Size Distribution (PSD)	AS1289.3.6.1	18
Atterberg Limits and Linear Shrinkage (PI)	AS1289.3.1.1, 3.2.1, 3.3.1, & 3.4.1	17
Natural Moisture Content	AS1289.2.1.1	17
Soil Aggressivity Suite (pH, SO_4^{2-}, Cl^-)	AS1289.4.3.1 & In house	8
Soil Particle Density (Specific Gravity)	AS1289.3.5.1	18
Point Load Strength Index	AS4133.4.1	3

4.7 Groundwater

Groundwater was encountered in some boreholes and inferred to be present in some CPT locations but was absent from other locations.

Five (5) groundwater monitoring wells were installed across the site to allow for measurement of groundwater levels following the field investigation. Groundwater depth readings were taken at two different times following the field investigation which are summarised in Table 3 below. Groundwater measurements likely represent seasonal lows based on the time of measurement. Higher groundwater elevation can be expected during seasonal high periods which typically occur during September to October.

Table 3: Groundwater Monitoring

Well Location	Date Installed	Measurement 1 - (17/03/2026)		Measurement 2 – (31/03/2026)	
		Groundwater Depth (m bgl)	Groundwater Elevation (m AHD)	Groundwater Depth (m bgl)	Groundwater Elevation (m AHD)
BH21	16/02/26	10.50	49.60	12.34	47.76
BH53	19/02/26	5.20	49.50	6.84	47.86
BH77	20/02/26	12.12	48.18	11.16	49.14
BH133	09/02/26	5.22	41.88	5.14	41.96
BH165	12/02/26	9.65	32.45	10.14	31.96

4.8 Omitted Test Locations

The following test locations are omitted from this report for the reasons stated in Table 4 below.

Table 4: Omitted Test Locations

Location ID	Reason for omission
BH01 – CPTu16	See Section 2.1.1 of this report. Acciona is relying upon existing geotechnical information for these locations.
CPTu38, CPTu160	Potentially erroneous due to machine computing errors during CPT testing. Data not presented.
BH95, BH101	Not completed due to poor site access. To be completed and included in a future revision.
CPTu174	Not completed due to poor site access. Removed.

5.0 GROUND MODEL

The ground conditions encountered are consistent with the published geology. A geotechnical model has been developed for the site based on interpretation of the site investigation and laboratory data, with reference to published geological information and the “Perth” sheet of the GSWA 1:50,000 Environmental Geology Series (Gozzard, 1986).

5.1 Engineering Geological Units

The following engineering geological units were encountered during the investigation.

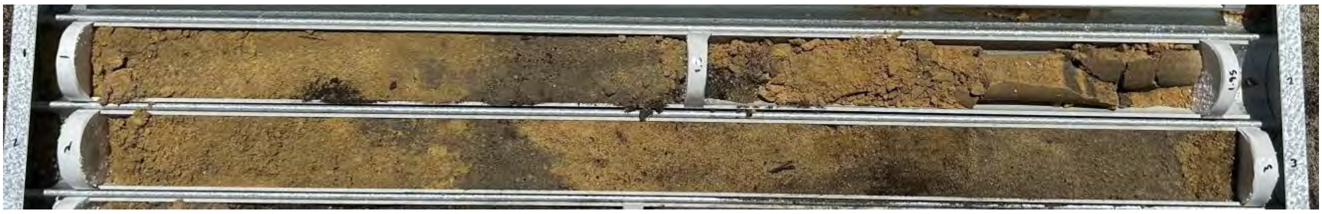
- Fill
- Sands Derived from Tamala Limestone (here in referred to as Tamala Sand)
- Tamala Limestone
- Duricrust
- Bassendean Sand
- Gnangara Sand

5.1.1 Fill

Fill was encountered at multiple locations along the alignment at depths of generally up to 1.0 m, however locally deeper deposits up to 4.5 m deep were observed along Ocean Reef Road. Fill is expected to occur along most of the alignment in areas of development.

Fill materials were variable in composition but generally comprised reworked granular material (predominantly fine to coarse grained, quartz sand with traces of fine-grained gravel) with a low fines content. Fill materials were observed to be generally consistent across the alignment.

Figure 4: Fill Material (BH149 1.0 – 2.0m)



5.1.2 Tamala Sand

Tamala Sand was encountered consistently along Ocean Reef Road and scattered over other areas of the site. Tamala Sand from both a residual and aeolian origin have been interpreted to exist within the project area. The residual Tamala Sand unit represents an *in situ* weathering profile of the underlying Tamala Limestone, while the aeolian unit represents a younger material which has been transported by wind and redeposited across the site. The residual Tamala Sand is limited to the westernmost extent of the site where Tamala Limestone is present, while the aeolian Tamala Sand unit is present both above the residual unit, but also extends across the wider site where Tamala Limestone was not encountered or mapped to be present.

Tamala Sand was identified as a fine to medium grained, sub-angular to sub-rounded quartz sand with trace fines content. The residual Tamala Sand sometimes had a higher fines content (up to 12% fines). The aeolian Tamala Sand is pale-yellow in colour, typical of Tamala Sand material observed across most of the Perth area. The residual unit appears similar in colour, but it also seen as a brown, orange, to grey sand which is likely the result of the leaching of minerals due to groundwater level and chemistry variations.

Figure 5: Tamala Sand – Aeolian Origin (BH141 6.0 – 8.0 m)

Figure 2: Tamala Sand – Residual Origin (BH141 10.0 – 12.0 m)

5.1.3 Tamala Limestone

Tamala Limestone was encountered in the south-western portion of the site along the western extent of Ocean Reef Road. The Tamala Limestone is distinguished from the overlying Tamala Sand by the presence of gravelly soils which are derived from the *in situ* weathering of the Tamala Limestone, or by the increase in scatter of CPT shaft resistance or upon encountering refusal.

The unit was encountered as either a sand/gravel mixture or an impure calcarenite, which are described as:

- **Sandy Gravel/gravelly Sand**: Fine to coarse grained, angular to sub-angular quartz and carbonate sand, intermixed with fine to coarse gravel sized gravel and trace cobbles of calcarenite. Yellow to pale orange. These materials are assumed to represent an extremely weathered limestone profile and are found both within the transition zone from soil to rock and as highly weathered zones within the limestone profile. This subunit likely represents the upper limit of potential rock strength materials.
- **Impure Calcarenite**: fine to medium grained calcarenite, pale yellow orange, cemented mixture of quartz and calcium carbonates, with traces of fines and gravel throughout. This unit represents the rock quality material of the Tamala Limestone.

The Tamala Limestone at this site can be associated with the Balcatta Dune of the Spearwood Dune System, which runs in a roughly north-south orientation across the Swan Coastal Plain, intersecting Ocean Reef Road just east of Wanneroo Road and continuing north along the eastern bank of Lake Joondalup. This intersection point roughly correlates with the highest point of elevation along the alignment, inferred as a local high point of the dune and where Tamala Limestone is also to be shallowest. Tamala Limestone is expected to be limited to this area of the alignment.

Tamala Limestone displays an irregular and unpredictable surface profile due of chemical weathering, meaning that the depth of the Limestone rock head can rapidly change over short distances. Colloquially these variations in the rock surface are referred to as limestone pinnacles. Accordingly, limestone may be present both shallower and deeper than what has been encountered in this investigation.

Figure 6: Tamala Limestone (BH161 11.0 – 14.0 m)

5.1.4 Duricrust

Duricrust (colloquially known as Coffee Rock) was encountered intermittently across the site. Duricrust was identified as a horizon of weakly cemented, dark brown to black quartz sand and is defined as Grade DIII according to AS1726-2017.

The term “duricrust” has been reserved for soil units where the degree of cementation has reached a point where it has begun to alter the *in situ* geotechnical properties of the soil. In some areas of the site there is evidence of weak cementation which could be interpreted as a poorly cemented or developing duricrust, however, if the cementation has not significantly altered the material properties, then the term duricrust has not been used.

There is potential for variability within the duricrust profile across the site. In some areas a thick, well cemented duricrust may be encountered, and in other areas duricrust may be absent entirely. Duricrust at this site occurs primarily within the Bassendean Sand units and is often present near the existing groundwater surface.

No rock strength duricrust was encountered within the boreholes, however CPTu refusal was encountered in several locations which likely represent zones with a higher degree of cementation, and potentially rock strength material (Ferricrete).

Figure 7: Duricrust (BH57 7.0 – 9.0m)

5.1.5 Bassendean Sand

Bassendean Sand was one of the primary units encountered across the site. It was generally logged as a fine to medium grained, sub-angular to rounded, pale grey to dark grey and brown quartz sand with trace fines content. Bassendean Sand is differentiated from Tamala Sand by its colour (generally grey/brown as opposed to yellow/orange), a higher relative density, and an absence of calcium carbonate content generally associated with Tamala Limestone.

Figure 8: Bassendean Sand (BH37 11.0 – 13.0 m)

5.1.6 Gnangara Sand

Gnangara Sand is interpreted at depth through a short section of the alignment near Gnangara Lake and sporadically through the northern section of the alignment. Gnangara Sand was observed as grey to brown, sand dominated profile with lenses of clayey sand and sandy clay. These lenses were typically deeper in the profile (>10 m deep) and more prominent near Gnangara Lake.

Gnangara Sand is interpreted to underlie the Bassendean Sand, noting the boundary between the two units is conformably. Due to the sandy nature of the soils at this site, the exact transition from Bassendean Sand to Gnangara Sand was sometimes ambiguous, and it is likely that some of the wider Bassendean Sand material can be associated with the Gnangara Sand.

Figure 9: Gnangara Sand (BH133 13.0 – 15.0 m)

5.2 Laboratory Test Results

Laboratory test results are summarised in Table E.1 presented in Appendix E alongside laboratory test certificates. In general, the soil classification testing was in agreeance with the field logging.

6.0 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

6.1 Geotechnical Design Profile

A geotechnical design profile has been created for the alignment. The design profile has been separated into three zones (denoted Zones 1 to 3) to best capture the change in ground conditions across the site. Note that the "zones" provided below are different to the topographical "sections" discussed earlier in this report, hence the change in nomenclature from section to zone.

Within each zone we have provided geotechnical design parameters and pile design parameters which have been derived as discussed in Section 6.1.1 and 6.1.2 of this report.

6.1.1 Geotechnical Design Parameters

Geotechnical design parameters have been derived separately for each zone of the alignment from a combination of SPT and CPT data, lab test results, and our experience with similar materials.

In general, there was agreeance between the interpreted SPT and CPT soil strength properties, however in some locations the SPT appeared to underestimate soil strength compared to the CPT. A priority has been given to the CPTu data for the assessment of soil density/consistency due to the substantial amount of CPTu data across the alignment, and also because it is generally considered a more reliable indicator of the *in-situ* condition and is less impacted by drilling related disturbance effects.

Geotechnical design parameters for each zone can be found in the following sections/tables contained in this report. Note that CH 0 to CH 1,800 m (Poles 1 to 16) is not covered in this report.

- Zone 1 (CH 1,800 m to CH 17,250 m): Section 6.2, Table 6.
- Zone 2 (CH 17,250 m to CH 18,350 m): Section 6.3, Table 9.
- Zone 3 (CH 18,350 m to CH 23,250 m): Section 6.4, Table 12.

6.1.2 Pile Design Parameters

Preliminary pile design parameters have been prepared for each zone. The client has advised that all transmission poles will be steel pole structures supported on a single mono pile with a 1.8 to 2 m in diameter, with a maximum depth of 12 m. This has been considered in determining the preliminary pile design parameters.

Preliminary pile design parameters for each zone can be found in the following sections/tables contained in this report:

- Zone 1 (CH 1,750 m to CH 17,250 m): Section 6.2, Table 7.
- Zone 2 (CH 17,250 m to CH 18,350 m): Section 6.3, Table 10.
- Zone 3 (CH 18,350 m to CH 23,250 m): Section 6.4, Table 13.

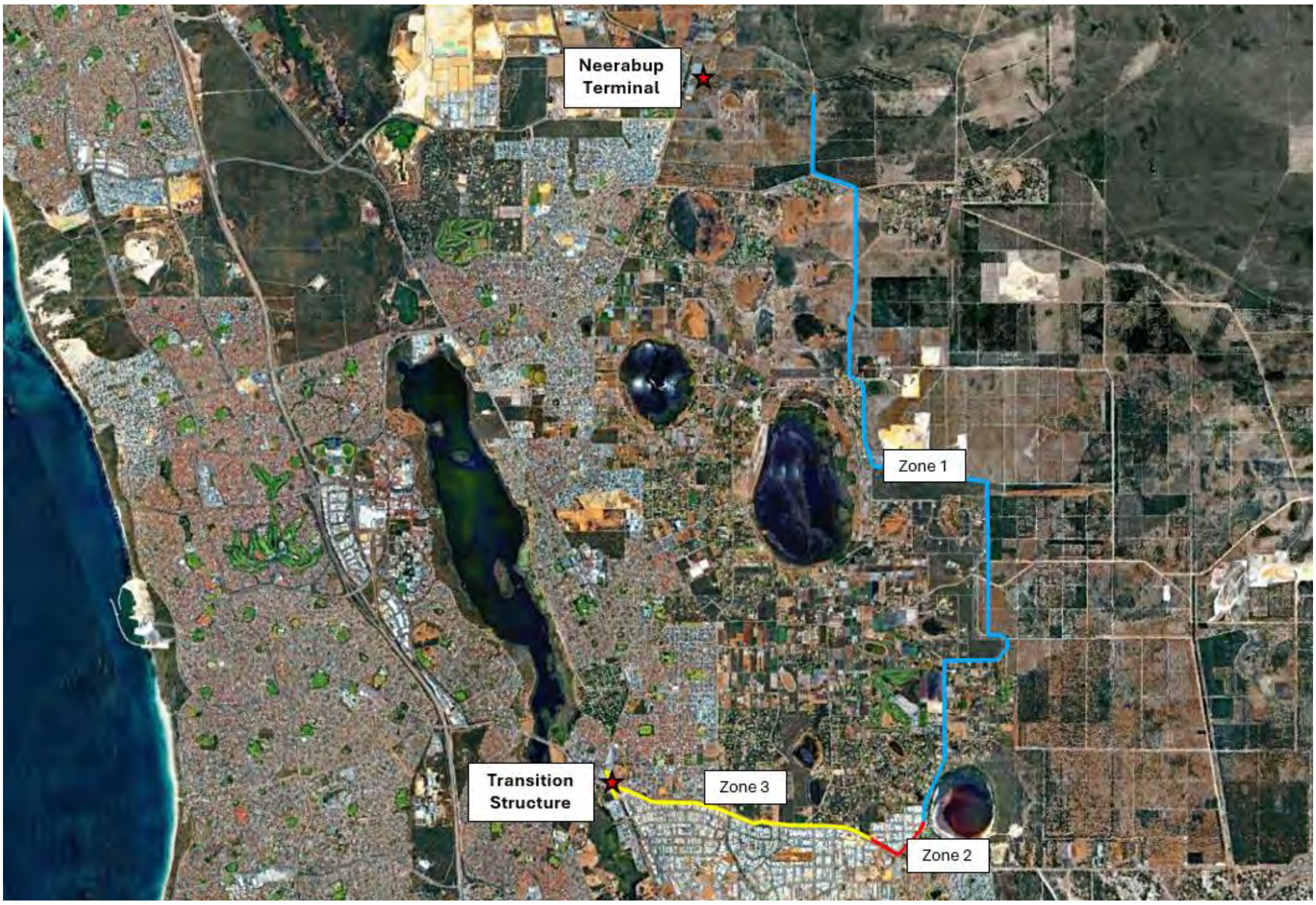
All pile foundation design, including the design geotechnical strength reduction factor (ϕ_g), must be carried out in accordance with AS2159.

The pile design is likely to be limited by lateral loading, and the pile designer should consider lateral loading when determining pile diameter and depths.

6.2 Zones

The approximate extent of each zone is shown graphically on Figure 15 below.

Figure 15: Relationship between Zones 1 to 3



6.3 Zone 1 - Northern Alignment

Zone 1 ranges between CH 1,800 m to CH 17,250 m, covering the site area between Bardie Road and Gnangara Lake. Zone 1 applies to pole numbers 17 to 128. Zone 1 is the largest zone and encompasses the entirety of the northern and central sections of the alignment. The topography of Zone 1 is represented by Section 2, Section 3, and the northern portion of Section 4 as discussed earlier in this report.

The geotechnical conditions of Zone 1 are characterized primarily by a deep Bassendean Sand profile overlying a basal Gnangara Sand, and the presence of a variable duricrust layer.

The Bassendean Sand profile across Zone 1 is generally medium dense to dense near the surface, becoming dense with depth. Duricrust materials (where present) are generally dense to very dense. Bassendean sand was observed to be relatively consistent across Zone 1. Conversely, high variability was observed within the duricrust profile in terms of depth encountered, layer thickness, and degree of cementation. In some locations duricrust was not present at all.

Tamala Sand of aeolian origin was interpreted to overly the Bassendean Sand in areas of locally higher elevation. Tamala Sand in this area was typically medium dense and exhibits similar engineering properties to Bassendean Sand. For the purposes of simplifying this model, Tamala Sand in Zone 1 has been incorporated as part of the Bassendean Sand profile.

A basal Gnangara Sand layer was intersected in some locations and has been interpreted at depth throughout Zone 1. The Gnangara Sand surface is relatively flat, being encountered between RL 42 m AHD to RL 38 m AHD. Gnangara Sand is differentiated from Bassendean Sand by the presence of minor clayey lenses, or by a noticeable increase in CPT cone tip resistance or SPT N value. Gnangara Sand is generally dense to very dense.

Several swamps and lakes are mapped near Zone 1. Although they have not been encountered in this investigation, it is possible that they may be present in other areas of Zone 1.

Fill across Zone 1 was limited to the near surface, however deep deposits of topsoil were encountered in some areas which could be associated with anthropogenic disturbance, for example due to historic forestry or agricultural activities.

The groundwater surface across Zone 1 is roughly flat, ranging between approximately RL 56.7 m AHD in the north of Zone 1, to RL 46.0 m AHD in the south, however with higher elevations as high as RL 77 m AHD recorded in some areas. This correlates to generally between 4 m to 13 m bgl. Groundwater was marginally shallower at BH61 and CPTu62, and between CPTu121 and CPTu128, where groundwater was between 3.0 m to 3.5 m bgl (summer conditions).

The following information is provided for Zone 1 below:

- Generalised Geotechnical Model – Table 5
- Geotechnical Design Parameters – Table 6
- Preliminary Pile Design Parameters – Table 7

Table 5: Geotechnical Model – Zone 1

Engineering Geological Unit	**Primary Lithology**	**Top Depth Encountered (m bgl)**		**Unit Thickness Range (m)**
		Minimum	**Maximum**	
Fill Material[1]	SAND	0.0	N/A	0.0 to 1.0 m
Bassendean Sand (inclusive of Tamala Sand)	SAND	0.0	1.0	9.8 to > 15 m
Duricrust[1]	Weakly to moderately cemented SAND	2.5	10.4	0.5 to 5.5 m
Gnangara Sand[1]	SAND with clay lenses	9.8	14.7	1.0 to > 5.2 m

Notes: 1 – Unit not encountered in all locations
2 – The values presented are ranges across various test locations.
3 – The groundwater surface ranges between RL 56.7 to RL 46.0m AHD (Jan/Feb 2026)

Table 6: Geotechnical Design Parameters – Zone 1

Engineering Geological Unit	**Soil Type (*Density/strength*)**	**ϒ (kN/m^3)**	**ϕ’ (deg)**	**c’ (kPa)**	**Su (kPa)**	**E (MPa)**
Fill Material	SAND (*Medium dense*)	17	33	-	-	20
Bassendean Sand (inclusive of Tamala Sand)	SAND (*Medium dense*)	18	34	-	-	40
	SAND (*Dense to very dense*)	18.5	36	-	-	60
Duricrust	Cemented SAND (*Dense to very dense*)	19	37	-	-	60
Gnangara Sand	SAND (*Dense to very dense*)	18.5	37	-	-	100

Table 7: Preliminary Pile Design Parameters – Zone 1

Engineering Geological Unit	Ultimate Capacity (Compression)	
	Shaft (kPa)	Base (MPa)
Fill Material	-	-
Bassendean Sand	30	3.0
Gnangara Sand	70	6.0

Notes: **1: Unit depths vary across the alignment. Reference should be made to the individual test location records when determining an appropriate depth range.**

The shaft capacity and passive resistance provided by the soil to a depth of 1.5 pile diameters must be ignored

Minimum pile embedment depth in the layer is 3 x pile diameters

The above values have been determined based on an assumed minimum pile toe of 6 m below ground level.

Capacities provided are ultimate values in compression. The designer must apply appropriate reductions based on the piling techniques adopted and if used in tension.

The groundwater surface ranges between RL 56.7 to RL 46.0m AHD (Jan/Feb 2026)

6.4 Zone 2 – Gnangara Lake to Ocean Reef Road

Zone 2 ranges between CH 17,250 m to CH 18,350 m, covering a short portion of the alignment south of Gnangara Lake, near the intersection of Sydney Road and Ocean Reef Road. Zone 2 applies to pole numbers 129 to 136. The topography of Zone 2 is represented by the southern portion of Section 4 and the eastern portion of Section 5 as discussed earlier in this report.

Like Zone 1, the geotechnical conditions of Zone 2 are characterized by a predominantly Bassendean Sand soil profile, but Zone 2 is differentiated from Zone 1 by the presence of larger quantities of clayey Gnangara Sand material at depth, a shallow groundwater surface, and the lack of a readily definable duricrust layer.

Deep deposits of fill were also encountered in areas along Zone 2, ranging to depths between 0.5 to 3.0 m thick, being at its deepest at the intersection of Sydney Road and Ocean Reef Road (CH 17,950 m). Fill was observed as medium dense to very dense mixtures of sand.

Bassendean Sand underlies the fill and is medium dense to dense near the surface, becoming dense with depth. Mixtures of sandy and clayey Gnangara Sand is interpreted from depths of 10.5 to 13.5 m bgl, correlating to between RL 30.5 m AHD and RL 35.7 m AHD. Gnangara Sand with low fines content is dense to very dense, while clayey materials (both clayey sand and sandy clay) are loose to medium dense and very stiff, respectively.

Gnangara Sand has been differentiated from Bassendean sand by the presence of clayey material and a noticeable increase in both CPT q_c and SPT N value.

The groundwater surface measured at the time of the investigation ranges between RL 42.0 and RL 43.2 m AHD, corresponding to between approximately 2.0 to 5.0 m below existing ground level (summer conditions). These were the shallowest groundwater measurements across the site. These measurements were taken in late summer conditions when groundwater is expected to be near its lowest.

The following information is provided for Zone 2 below:

- Generalised Geotechnical Model – Table 8
- Geotechnical Design Parameters – Table 9
- Preliminary Pile Design Parameters – Table 10

Table 8: Geotechnical Model: Zone 2

Engineering Geological Unit	Primary Lithology	Top Depth Encountered (m bgl)		Unit Thickness Range (m)
		Minimum	Maximum	
Fill Material[1]	SAND	0.0	N/A	0.0 to 3.0 m
Bassendean Sand (inclusive of Tamala Sand)	SAND	0.0	3.0	7.5 to >15 m
Gnangara Sand	Clayey SAND to Sandy CLAY	11.0	12.9	0.5 to 0.9 m
	SAND	9.8	14.7	1.5 to > 3.7 m

Notes: 1 – Unit was not encountered in all locations

2 – The values presented are ranges across various test locations.

3 – The groundwater surface ranges between RL 43.6 to RL 42.0m AHD (Jan/Feb 2026)

Table 9: Geotechnical Design Parameters: Zone 2

Engineering Geological Unit	Soil Type (*Density/strength*)	ϒ (kN/m^3)	ɸ’ (deg)	c’ (kPa)	Su (kPa)	E (MPa)
Fill Material	SAND	17	33	-	-	20
Bassendean Sand	SAND (*Medium dense to dense*)	18	35	-	-	50
Gnangara Sand	SAND (*Dense to very dense)*	18.5	37	-	-	100
	Clayey SAND (*Loose to medium dense*)	17.5	34	-	-	40
	Sandy CLAY to CLAY (*Stiff to very stiff)*	17	30	3	75	30

Table 10: Preliminary Pile Design Parameters – Zone 2

Engineering Geological Unit		Ultimate Capacity (Compression)	
		Shaft (kPa)	Base (MPa)
Fill Material		-	-
Bassendean Sand		30	3.0
Gnangara Sand	SAND	50	6.0
	Clayey Sand/Sandy CLAY	35	0.5 – 1.0

Notes: **1: Unit depths vary across the alignment. Reference should be made to the individual pole location when determining an appropriate depth range.**

The shaft capacity and passive resistance provided by the soil to a depth of 1.5 pile diameters must be ignored

Minimum pile embedment depth in the layer is 3 x pile diameters

The above values have been determined based on an assumed minimum pile toe of 6 m below ground level.

Capacities provided are ultimate values in compression. The designer must apply appropriate reductions based on the piling techniques adopted and if used in tension.

The groundwater surface ranges between RL 43.6 to RL 42.0m AHD (Jan/Feb 2026)

6.5 Zone 3 – Ocean Reef Road

Zone 3 ranges between CH 18,350 m to CH 23,250 m, covering Ocean Reef Road. Zone 3 applies to pole numbers 137 to 175. The topography of Zone 3 is represented by Section 5 discussed earlier in this report.

The geotechnical conditions of the area are characterized by a variable depth of fill, a Tamala Sand profile, the presence of Tamala Limestone in the west, and a deeper groundwater surface.

Fill was encountered up to 4.2 m below the surface, although was generally less than 2 m thick, and comprised loose to very dense sand mixtures. Fill in this area is likely associated with the construction of road embankments and nearby building/infrastructure. Considering the built environment of Zone 3, fill is likely present across most of the area to variable depths.

Tamala Sand is inferred at all locations across Zone 3. The Tamala Sand is predominantly of aeolian origin, with some residual material inferred in the west where Tamala Limestone is present. Tamala Sand is observed to be thinnest near the intersection of Sydney Road and Ocean Reef Road where it is overlies Bassendean Sand at pole 137. The thickness of Tamala Sand increases with chainage, and the top of the Bassendean Sand profile quickly drops below the depth of investigation. Considering that Bassendean Sand is limited to only a small section of Zone 3, and that it exhibits similar engineering properties to Tamala Sand, for the purposes of this model it may be simplified as part of the Tamala Sand profile in this area.

Duricrust was observed in BH137 within the Bassendean Sand unit. Duricrust is not expected to occur within Tamala Sand. Like Bassendean Sand, duricrust is expected to be limited to the eastern segment of Zone 3 nearest to Sydney Road and therefore is not considered geotechnically significant for Zone 3.

Tamala Sand between chainages CH 18,350 to CH 19,250 m was dense. From CH 19,250 m onwards, the density of the upper profile (upper 10 m) reduces to medium dense, however the deeper soil profile (beyond 10 m) remains dense. There is a general trend for density to increase towards the west.

Tamala Limestone was encountered beneath Tamala Sand from 7.7 m bgl (RL 57.2 m AHD) in BH161 and inferred to be present between 9.8 m and 14.9 m bgl (RL 66.1 m AHD to RL 37.9 m AHD) in nearby CPT locations (CPTu158, 162, 163, 164, and 175) based on an increase in the scatter of CPT q_c or upon encountering refusal. Tamala Limestone was moderately to extremely weathered. Extremely weathered material comprised medium dense to very dense mixtures of sand and gravel with trace calcarenite cobbles. Rock strength material was low to high strength. Limestone was only observed directly in BH161, and the properties of the Tamala Limestone may vary elsewhere.

There is potential for zones of loose Tamala Sand to be present near the limestone surface due to the infilling of limestone pinnacles.

The groundwater surface measured at the time of the investigation ranged between RL 42.0 m AHD in the east, gradually increasing the RL 50.7m AHD near the centre of Zone 3, before then decreasing to RL 21.7 m AHD in the west. Given the undulating topography of the area, these elevations correspond to between approximately 5m bgl in the east, to greater than 15m bgl (groundwater not encountered) through the centre of the zone, returning nearer to the surface 7 m bgl as the topography drops steeply towards the end of the alignment.

The following information is provided for Zone 3 below:

- Generalised Geotechnical Model – Table 11
- Geotechnical Design Parameters – Table 12
- Preliminary Pile Design Parameters – Table 13

Table 11: Geotechnical Model – Zone 3

Engineering Geological Unit	Primary Lithology	Top Depth Encountered (m bgl)		Unit Thickness Range (m)
		Minimum	Maximum	
Fill Material[1]	SAND	0.0	N/A	0.5 to 4.2 m
Tamala Sand (inclusive of Bassendean Sand)	SAND	0.5	4.2	7.6 to > 15 m
Tamala Limestone[1]	Impure Calcarenite	7.6	14.9	0.1 to > 7.4 m
Notes: 1 – Unit was not encountered in all locations 2 – The values presented are ranges across various test locations. 3 – The groundwater surface ranges between RL 50.7 to RL 21.7m AHD (Jan/Feb 2026)				

Table 12: Geotechnical Design Parameters: Zone 3

Engineering Geological Unit	Soil Type (*Density/strength*)	ϒ (kN/m^3)	ϕ' (deg)	c' (kPa)	Su (kPa)	E (MPa)	UCS (MPa)
Fill Material	SAND	17	33	-	-	20	-
Tamala Sand	SAND (*Medium dense*)	18	35	-	-	50	-
	SAND (Dense to very dense)	18.5	37	-	-	70	-
Tamala Limestone	XW SAND and GRAVEL (*Medium dense to dense*)	19	38	-	-	120	-
	Impure CALCARENITE (*Low to Medium strength*)	20	40	5	-	500	2.0-6.0

Table 13: Preliminary Pile Design Parameters – Zone 3

Engineering Geological Unit		Ultimate Capacity (Compression)	
		Shaft (kPa)	Base (MPa)
Fill material	SAND	-	-
Tamala Sand	SAND – medium dense	30	1.5
	SAND – dense to very dense	50	4.0
Tamala Limestone	XW SAND and GRAVEL	60	6.0
	Impure CALCARENITE	120	7.0
Notes: **1: Unit depths vary across the alignment. Reference should be made to the individual pole location when determining an appropriate depth range.** The shaft capacity and passive resistance provided by the soil to a depth of 1.5 pile diameters must be ignored Minimum pile embedment depth in the layer is 3 x pile diameters The above values have been determined based on an assumed minimum pile toe of 6 m below ground level. Capacities provided are ultimate values in compression. The designer must apply appropriate reductions based on the piling techniques adopted and if used in tension. The groundwater surface ranges between RL 50.7 to RL 21.7m AHD (Jan/Feb 2026)			

6.6 Geohazards

6.6.1 Uncontrolled Fill

Fill was encountered at multiple points along the alignment to depths of up to 4.2 m bgl. The poles will be supported on piles which are expected to extend beyond the fill and into the underlying natural soils, so it is unlikely that fill will affect the base capacity of the pile. However, it is possible that deep deposits of loose fill may reduce the shaft capacity, lateral capacity and deflection of the pile at the near surface.

If unexpected deep deposits of loose fill are encountered near the surface, then the pile should be inspected by a geotechnical engineer to confirm the suitability of the pile excavation prior to the pouring of concrete.

6.6.2 Swamp Deposits

The areas around Zones 1 and 2 are characterized by multiple swamp and lake systems. Although not directly encountered in this investigation, it is possible that surficial swamp material is present in other areas which may be encountered during construction.

Swamp deposits may comprise mixtures of clayey material with significant organic content, which will affect factors like soil reactivity and pile shaft capacity. Swamp Deposits are also expected to carry a high risk for Acid Sulfate Soils.

6.6.3 Shallow Groundwater

Shallow groundwater was encountered in the boreholes and inferred to be present in the CPTu at depths between 2.5 m and 4.0 m below ground level for the section of the alignment near Gnangara Lake.

These measurements were taken in late summer conditions where groundwater is expected to be near its lowest. The surficial sandy soils encountered at the site are expected to have relatively high permeability, and high inflow rates are anticipated for any excavation that extends below the groundwater level. Careful consideration will need to be given to a robust pile installation methodology so as not to cause disturbance or loosening of shallow soils.

6.6.4 Clayey Soils

Clayey soils were encountered within the Gnangara Sand in Zone 2 and may also be encountered in Zone 1. While the Gnangara Sand is generally considered a geotechnically competent unit and is favourable as a foundation material, the presence of these clayey soils can present geotechnical challenges and reduced pile base capacity due to their lower strength.

6.6.5 Duricrust

Duricrust was encountered from a range of depths within the Bassendean Sand across Zone 1, and to a lesser extent across Zone 2. Duricrusts form due to chemical weathering processes creating concentrated zones of cementing materials which strengthen relative to the surrounding soils. As a result, they often show variable strength properties which can both laterally and vertically.

The majority of duricrust encountered exhibited dense to very dense soil properties and are expected to be readily excavated with conventional piling equipment. However, it is possible that localised areas of more heavily cemented material (potentially rock strength) are present elsewhere. While these materials should still be excavated by a bored piling rig without issue, depending on the size of the piling rig and the methodology, slower advancement rates can be expected in sections where there is a more defined and developed duricrust. Duricrust may also affect the driving of pile casings if these are used.

6.6.6 Limestone Features

Tamala Limestone is present along the western extent of Ocean Reef Road. Tamala Limestone is known for having a highly variable surface profile, often characterized by irregular pinnacles, solution cavities, and intermittent cap rock layers formed through cementation processes. This can result in both an uneven surface, as well as highly variable strength properties, ranging between high strength caprock and lower strength weathered zones which may straddle the boundary between soil and rock properties.

From a design perspective, the variability in these properties can introduce risk in that the design assumptions may not be representative of the actual conditions encountered during construction. From a construction perspective, this variability can introduce uncertainty with regards to piling production rates and machinery requirements or might otherwise introduce complications in the piling process.

6.7 Soil Reactivity

The soils encountered within the shallow ground profile (i.e. upper 3 m) were granular with low fines and are not expected to exhibit any significant shrink-swell behaviour due to moisture changes. Traces of clayey materials were encountered across the alignment; however, the depth of these soils were beyond the zone of influence of soil reactivity. It is unlikely that soil reactivity will affect the design of structures.

Although not directly observed during this investigation, it is possible that clayey material may be present near the surface within either swamp deposits or fill deposits located elsewhere along the alignment. If, during construction, any unexpected clay deposits are identified within the upper 3m profile, then the reactivity of these soils should be assessed by a geotechnical engineer on a case-by-case basis prior to installing the pile.

6.8 Subsoil Classification

Based on our understanding of the general geology beneath the site, the results of our investigation and the recommendations provided in AS1170.4-2007 – Earthquake Actions in Australia, a site subsoil class of C_e (shallow soil site) to Section 4.2 of AS1170.4 is recommended for seismic design purposes.

6.9 Exposure Classification

The results of the aggressivity testing have been compared against the exposure classification definitions presented in AS5100-2004 Table 4.8 and AS2159-2009 Table 6.4.2 and 6.5.2. The resulting exposure classifications are summarised in Table 17.

The samples collected from the site indicate an exposure classification of non-aggressive to mild for concrete and steel piles in accordance with Table 6.4.2 and Table 6.5.2 in AS2159-2009 and exposure classification “A” to “B1” in accordance with Table 4.8 of AS5100-2004.

Swamp Deposits were not directly encountered during the investigation and therefore could not be tested for aggressivity. It is likely like swamp material would be more aggressive towards both steel and concrete. If these materials are encountered during construction, then additional testing should be completed.

Table 17: Soil Exposure Classification Summary

Location ID	Depth	Soil Type (*Geological Unit*)	Exposure Classification[1]	Exposure Classification[2]	
				Concrete Piles	Steel Piles
BH25	3.0 – 3.5	Bassendean Sand	A	Non-aggressive	Non-aggressive
BH41	4.0 – 4.5	Duricrust	B1	Mild	Non-aggressive
BH41	13.6 – 14.0	Gnangara Sand	A	Non-aggressive	Non-aggressive

Location ID	**Depth**	**Soil Type (*Geological Unit*)**	**Exposure Classification**[1]	**Exposure Classification**[2]	
				Concrete Piles	**Steel Piles**
BH53	11.0 – 11.5	Bassendean Sand	B1	Mild	Non-aggressive
BH77	13.5 – 13.95	Duricrust	B1	Mild	Non-aggressive
BH125	3.45 – 4.0	Duricrust	B1	Mild	Non-aggressive
BH149	3.3 – 3.5	Fill	A	Non-aggressive	Non-aggressive
BH153	10.0 – 10.5	Tamala Sand	A	Non-aggressive	Non-aggressive

Notes: 1: Determined in accordance with AS5100-2004 Table 4.8,
2: Determined in accordance with AS2159-2009 Table 6.4.2 and Table 6.5.2

7.0 CLOSURE

This report has been prepared for use by Acciona Construction Australia Pty Ltd in relation to the Clean Energy Link - North Project Double Circuit package (T0621770) in accordance with the scope, proposed uses and limitations described in the report. Should you have further questions relating to the use of your report please do not hesitate to contact us.

Where a party other than Acciona Construction Australia Pty Ltd seeks to rely upon or otherwise use this report, the consent of CMW should be sought prior to any such use. CMW can then advise whether the report and its contents are suitable for the intended use by the other party.

USING YOUR CMW GEOTECHNICAL REPORT

Geotechnical reporting relies on interpretation of facts and collected information using experience, professional judgement, and opinion. As such it generally has a level of uncertainty attached to it, which is often far less exact than other engineering design disciplines. The notes below provide general advice on what can be reasonably expected from your report and the inherent limitations of a geotechnical report.

Preparation of your report

Your geotechnical report has been written for your use on your project. The contents of your report may not meet the needs of others who may have different objectives or requirements. The report has been prepared using generally accepted Geotechnical Engineering and Engineering Geology practices and procedures. The opinions and conclusions reached in your report are made in accordance with these accepted principles. Specific items of geotechnical or geological importance are highlighted in the report.

In producing your report, we have relied on the information which is referenced or summarised in the report. If further information becomes available or the nature of your project changes, then the findings in this report may no longer be appropriate. In such cases the report must be reviewed, and any necessary changes must be made by us.

Your geotechnical report is based on your project's requirements

Your geotechnical report has been developed based on your specific project requirements and only applies to the site in this report. Project requirements could include the type of works being undertaken; project locality, size and configuration; the location of any structures on or around the site; the presence of underground utilities; proposed design methodology; the duration or design life of the works; and construction method and/or sequencing.

The information or advice in your geotechnical report should not be applied to any other project given the intrinsic differences between different projects and site locations. Similarly geotechnical information, data and conclusions from other sites and projects may not be relevant or appropriate for your project.

Interpretation of geotechnical data

Site investigations identify subsurface conditions at discrete locations. Additional geotechnical information (e.g. literature and external data source review, laboratory testing etc) are interpreted by Geologists or Engineers to provide an opinion about a site specific ground models, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist due to the variability of geological environments. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. Interpretation of factual data can be influenced by design and/or construction methods. Where these methods change review of the interpretation in the report may be required.

Subsurface conditions can change

Subsurface conditions are created by natural processes and then can be altered anthropically or over time. For example, groundwater levels can vary with time or activities adjacent to your site, fill may be placed on a site, or the consistency of near surface conditions might be susceptible to seasonal changes. The report is based on conditions which existed at the time of investigation. It is important to confirm whether conditions may have changed, particularly when large periods of time have elapsed since the investigations were performed.

Interpretation and use by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. To help avoid misinterpretations, it is important to retain the assistance of CMW to work with other project design professionals who are affected by the contents of your report. CMW staff can explain the report implications to design professionals and then review design plans and specifications to see that they have correctly incorporated the findings of this report.

Your report's recommendations require confirmation during construction

Your report is based on site conditions as revealed through selective point sampling. Engineering judgement is then applied to assess how indicative of actual conditions throughout an area the point sampling might be. Any assumptions made cannot be substantiated until construction is complete. For this reason, you should retain geotechnical services throughout the construction stage, to identify variances from previous assumption, conduct additional tests if required and recommend solutions to problems encountered on site.

A Geotechnical Engineer, who is fully familiar with the site and the background information, can assess whether the report's recommendations remain valid and whether changes should be considered as the project develops. An unfamiliar party using this report increases the risk that the report will be misinterpreted.

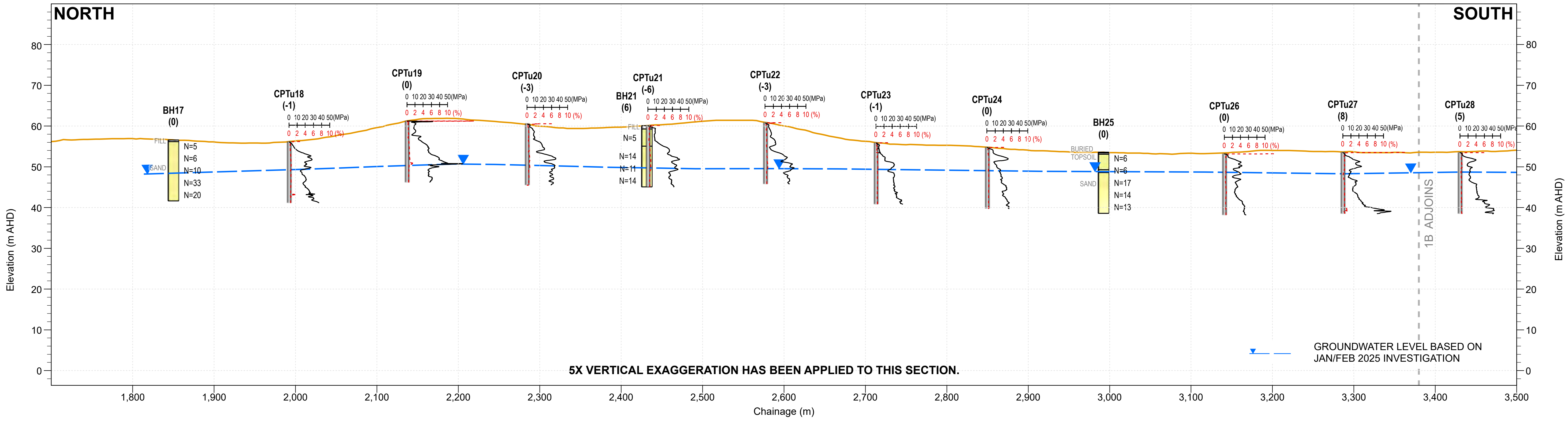
Environmental matters are not covered

Unless specifically discussed in your report environmental matters are not covered by a CMW Geotechnical Report. Environmental matters might include the level of contaminants present of the site covered by this report, potential uses or treatment of contaminated materials or the disposal of contaminated materials. These matters can be complex and are often governed by specific legislation.

The personnel, equipment, and techniques used to perform an environmental study can differ significantly from those used in this report. For that reason, our report does not provide environmental recommendations. Unanticipated subsurface environmental problems can have large consequences for your site. If you have not obtained your own environmental information about the project site, ask your CMW contact about how to find environmental risk-management guidance.

APPENDIX A

Drawings



100 50 0 100 200 300 400 500 m

Coordinate System: GDA2020 MGA Zone 50

LITHOLOGY UNIT

- ▨ FILL
- ▨ BURIED TOPSOIL
- 🟨 SAND

- CPT LOCATION
- CONE RESISTANCE - QC (MPA)
- FRICTION RATIO - RF (%)
- GROUND SURFACE

- MACHINE BOREHOLE
- CONE PENETRATION TEST

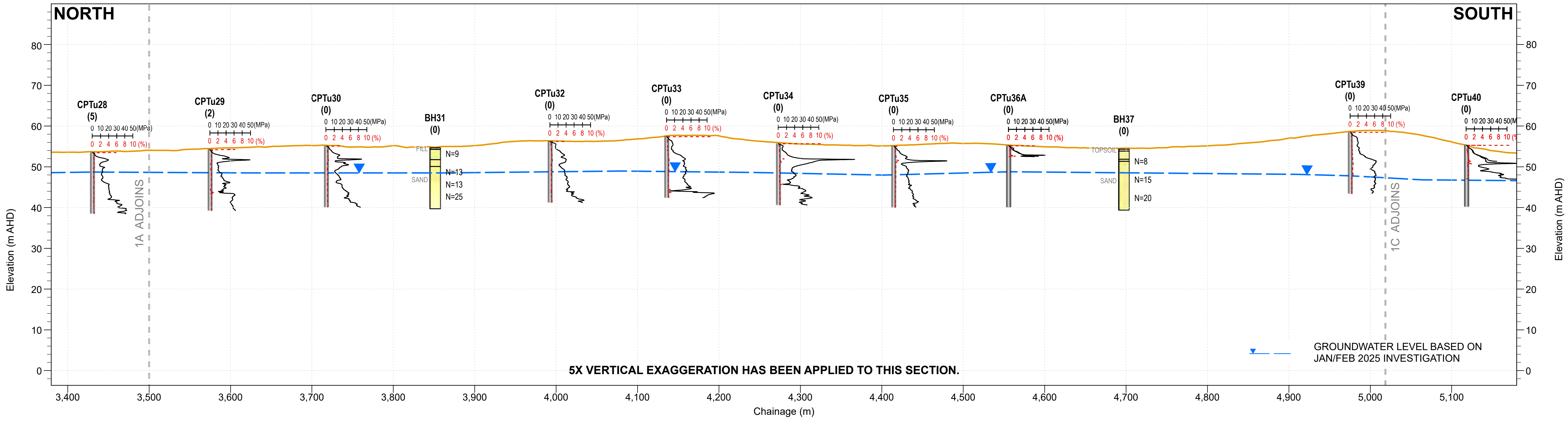
NOTES

1. BOREHOLE OFFSETS IN METRES FROM SECTION LINE SHOWN IN BRACKETS. BOREHOLES WITH LARGER POSITIVE OFFSETS LIE FURTHER AWAY FROM THE SECTION LINE AND OBSERVER.

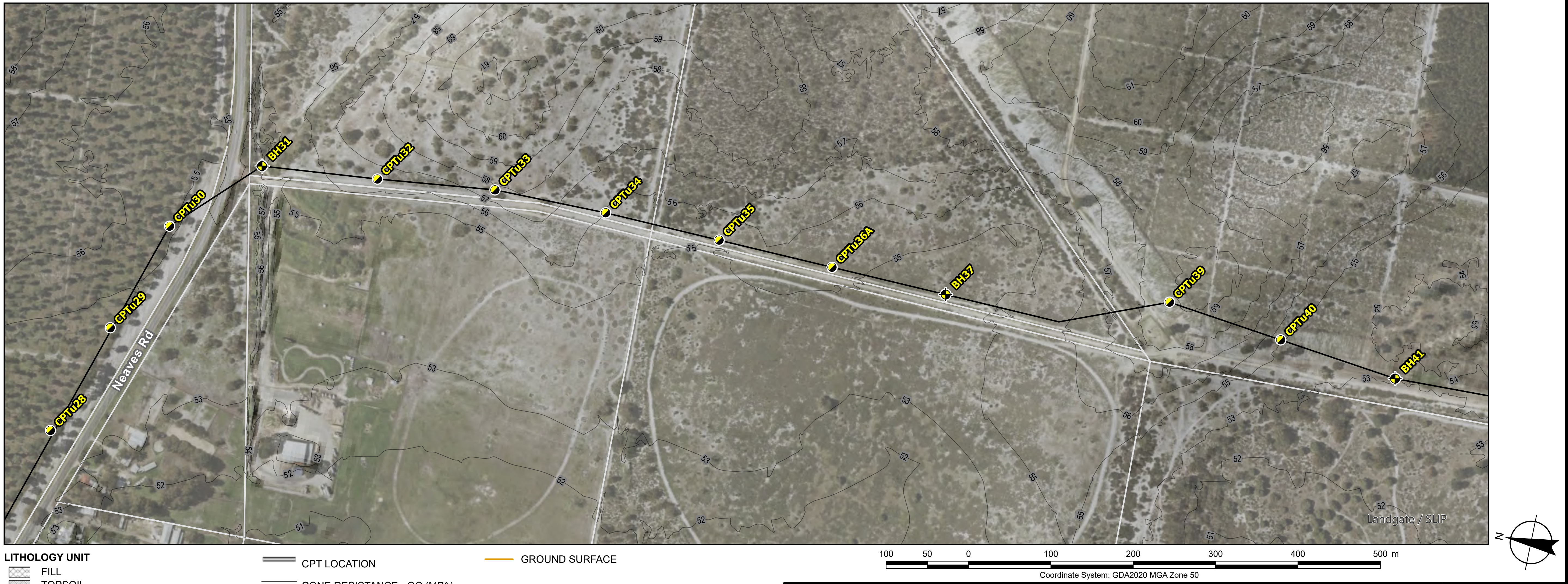
2. GROUND SURFACE BASED ON LIDAR 5M GRID SURFACE SOURCED ONLINE FROM ELVIS - ELEVATION AND DEPTH - FOUNDATION SPATIAL DATA (HTTPS://ELEVATION.FSDF.ORG.AU/) (GEOSCIENCE AUSTRALIA AND CSIRO LAND & WATER, 2009)

CMW Geosciences

CLIENT: **ACCIONA**		COMPILED: SR	PROJECT: PER2025-0250
PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**		CHECKED: LSW	FIGURE: 1A
		REVISION: 0	SCALE: H 1:5,000 V 1:1000
TITLE: **GEOLOGICAL SECTION A-A'**		DATE: 7/04/2026	SHEET: A3 L



5X VERTICAL EXAGGERATION HAS BEEN APPLIED TO THIS SECTION.



Coordinate System: GDA2020 MGA Zone 50

LITHOLOGY UNIT
▨ FILL
▨ TOPSOIL
🟨 SAND

CPT LOCATION
CONE RESISTANCE - QC (MPA)
FRICTION RATIO - RF (%)

GROUND SURFACE

● MACHINE BOREHOLE
● CONE PENETRATION TEST

NOTES
1. BOREHOLE OFFSETS IN METRES FROM SECTION LINE SHOWN IN BRACKETS. BOREHOLES WITH LARGER POSITIVE OFFSETS LIE FURTHER AWAY FROM THE SECTION LINE AND OBSERVER.

2. GROUND SURFACE BASED ON LIDAR 5M GRID SURFACE SOURCED ONLINE FROM ELVIS - ELEVATION AND DEPTH - FOUNDATION SPATIAL DATA (HTTPS://ELEVATION.FSDF.ORG.AU/) (GEOSCIENCE AUSTRALIA AND CSIRO LAND & WATER, 2009)

CMW Geosciences

CLIENT:	**ACCIONA**	COMPILED:	SR	PROJECT:	PER2025-0250
PROJECT:	**CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**	CHECKED:	LSW	FIGURE:	1B
		REVISION:	0	SCALE:	H 1:5,000 V 1:1000
TITLE:	**GEOLOGICAL SECTION A-A'**	DATE:	7/04/2026	SHEET:	A3 L

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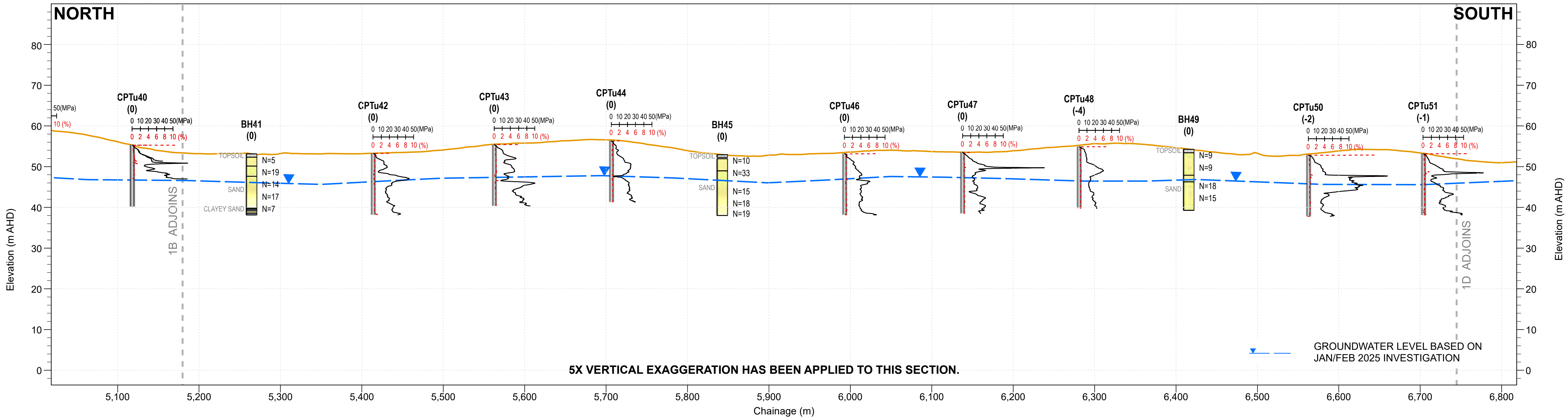

LITHOLOGY UNIT

▨	TOPSOIL
🟨	SAND
🟨	CLAYEY SAND
▨	SANDY CLAY

▬	CPT LOCATION
—	CONE RESISTANCE - QC (MPA)
- - -	FRICTION RATIO - RF (%)
—	GROUND SURFACE

⊕	MACHINE BOREHOLE
●	CONE PENETRATION TEST

NOTES

1. BOREHOLE OFFSETS IN METRES FROM SECTION LINE SHOWN IN BRACKETS. BOREHOLES WITH LARGER POSITIVE OFFSETS LIE FURTHER AWAY FROM THE SECTION LINE AND OBSERVER.

2. GROUND SURFACE BASED ON LIDAR 5M GRID SURFACE SOURCED ONLINE FROM ELVIS - ELEVATION AND DEPTH - FOUNDATION SPATIAL DATA (HTTPS://ELEVATION.FSDF.ORG.AU/) (GEOSCIENCE AUSTRALIA AND CSIRO LAND & WATER, 2009)

CMW Geosciences

CLIENT: **ACCIONA**	COMPILED: SR	PROJECT: PER2025-0250
PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**	CHECKED: LSW	FIGURE: 1C
	REVISION: 0	SCALE: H 1:5,000 V 1:1000
TITLE: **GEOLOGICAL SECTION A-A'**	DATE: 7/04/2026	SHEET: A3 L

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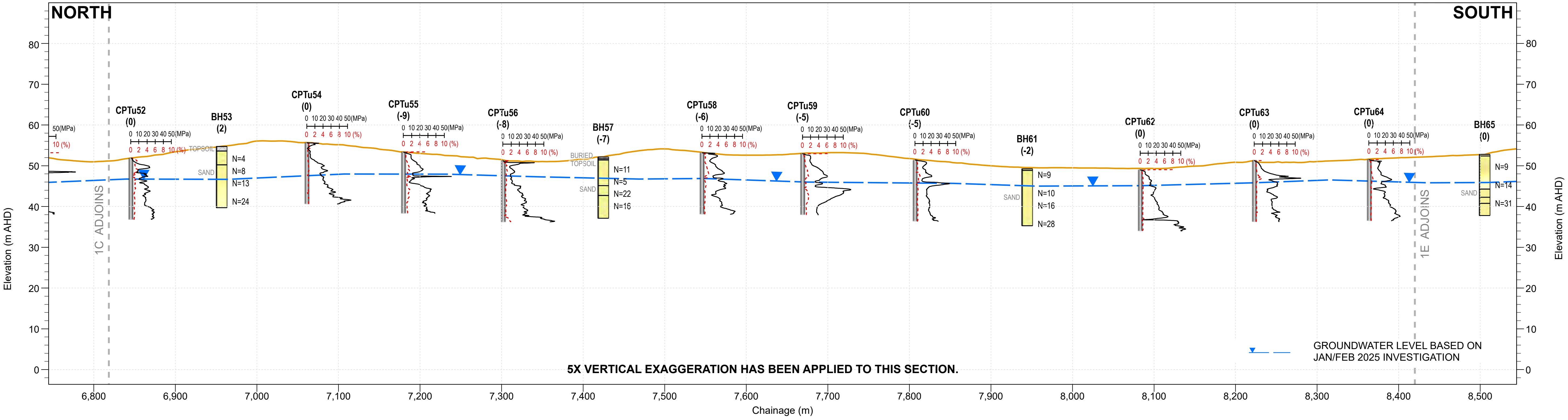

LITHOLOGY UNIT

- ▨ FILL
- ▨ TOPSOIL
- ▨ BURIED TOPSOIL
- 🟨 SAND

- ⊕ MACHINE BOREHOLE
- ● CONE PENETRATION TEST

- ▬ CPT LOCATION
- — CONE RESISTANCE - QC (MPA)
- - - FRICTION RATIO - RF (%)
- — GROUND SURFACE

NOTES

1. BOREHOLE OFFSETS IN METRES FROM SECTION LINE SHOWN IN BRACKETS. BOREHOLES WITH LARGER POSITIVE OFFSETS LIE FURTHER AWAY FROM THE SECTION LINE AND OBSERVER.
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CMW Geosciences

CLIENT: **ACCIONA**	COMPILED: SR	PROJECT: PER2025-0250
PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**	CHECKED: LSW	FIGURE: 1D
	REVISION: 0	SCALE: H 1:5,000 V 1:1000
TITLE: **GEOLOGICAL SECTION A-A'**	DATE: 7/04/2026	SHEET: A3 L

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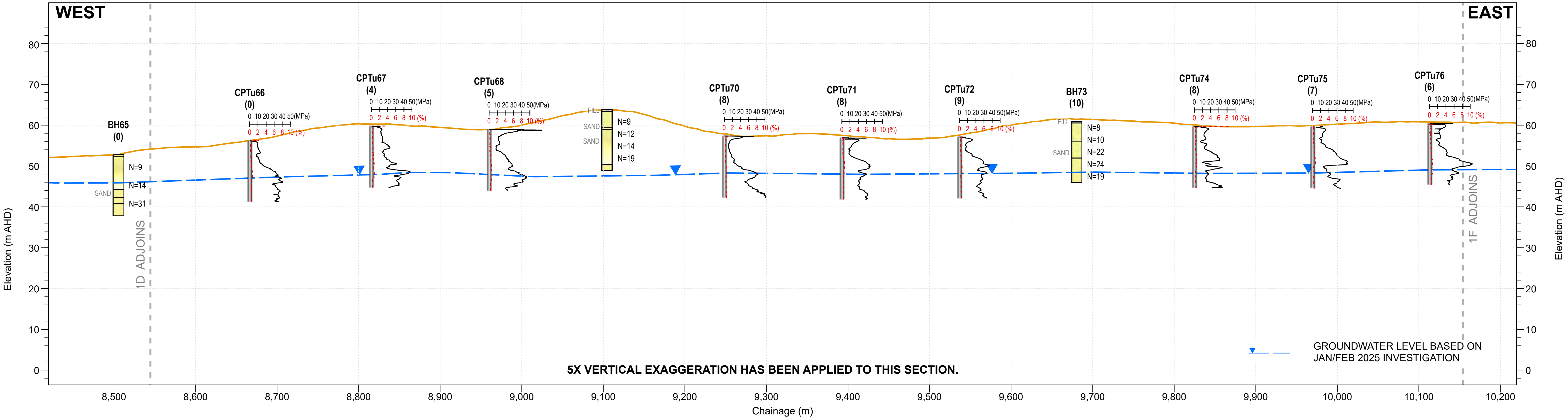

LITHOLOGY UNIT

▨ FILL

▨ TOPSOIL

🟨 SAND

CPT LOCATION

CONE RESISTANCE - QC (MPA)

FRICTION RATIO - RF (%)

GROUND SURFACE

GROUNDWATER LEVEL BASED ON JAN/FEB 2025 INVESTIGATION

● MACHINE BOREHOLE

● CONE PENETRATION TEST

NOTES

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CMW Geosciences

CLIENT: **ACCIONA**	COMPILED: SR		PROJECT: PER2025-0250
PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**	CHECKED: LSW		FIGURE: 1E
	REVISION: 0		SCALE: H 1:5,000 V 1:1000
TITLE: **GEOLOGICAL SECTION A-A'**	DATE: 7/04/2026		SHEET: A3 L

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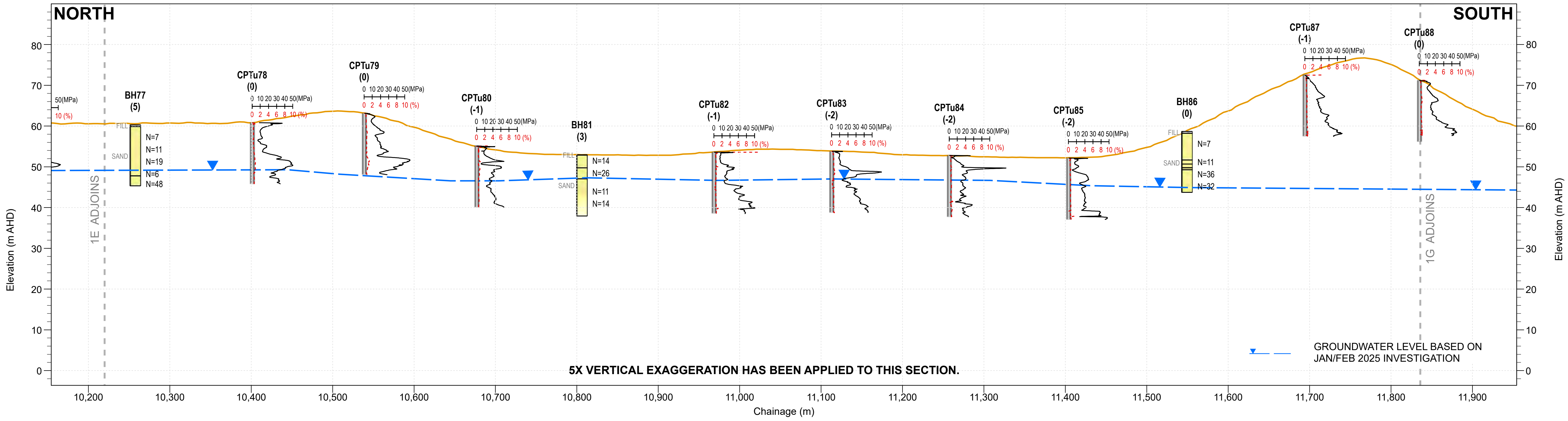

LITHOLOGY UNIT

▨	FILL
🟨	SAND
	CPT LOCATION
	CONE RESISTANCE - QC (MPA)
	FRICTION RATIO - RF (%)
	GROUND SURFACE
⊕	MACHINE BOREHOLE
●	CONE PENETRATION TEST

NOTES

1. BOREHOLE OFFSETS IN METRES FROM SECTION LINE SHOWN IN BRACKETS. BOREHOLES WITH LARGER POSITIVE OFFSETS LIE FURTHER AWAY FROM THE SECTION LINE AND OBSERVER.
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CMW Geosciences

CLIENT: **ACCIONA**		COMPILED: SR	PROJECT: PER2025-0250
PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**		CHECKED: LSW	FIGURE: 1F
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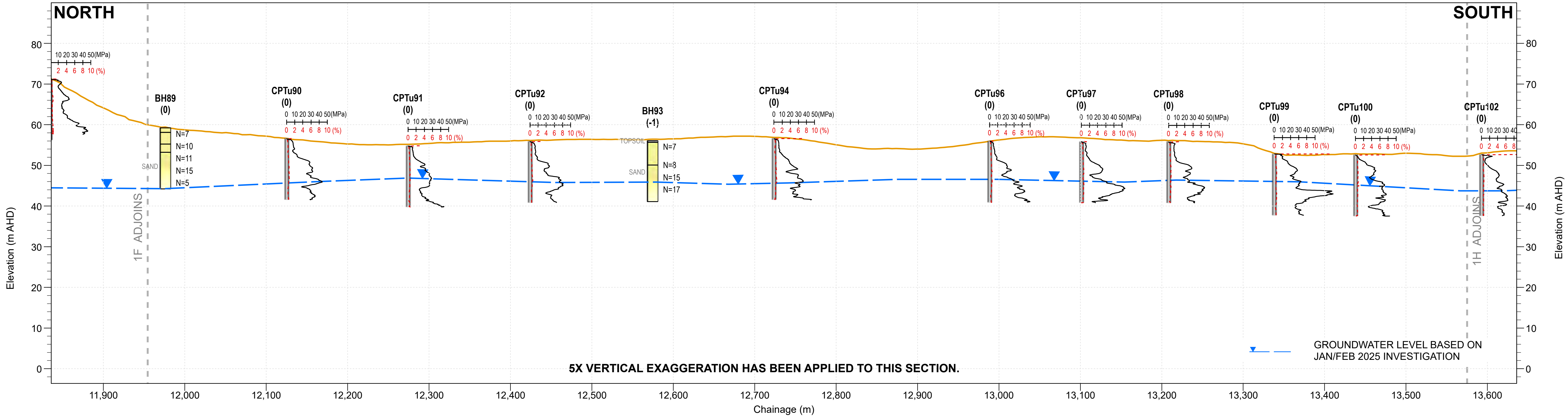

100 50 0 100 200 300 400 500 m

Coordinate System: GDA2020 MGA Zone 50

LITHOLOGY UNIT

▨	TOPSOIL
🟨	SAND

═	CPT LOCATION
—	CONE RESISTANCE - QC (MPA)
- - -	FRICTION RATIO - RF (%)
—	GROUND SURFACE
⊕	MACHINE BOREHOLE
●	CONE PENETRATION TEST

NOTES

1. BOREHOLE OFFSETS IN METRES FROM SECTION LINE SHOWN IN BRACKETS. BOREHOLES WITH LARGER POSITIVE OFFSETS LIE FURTHER AWAY FROM THE SECTION LINE AND OBSERVER.

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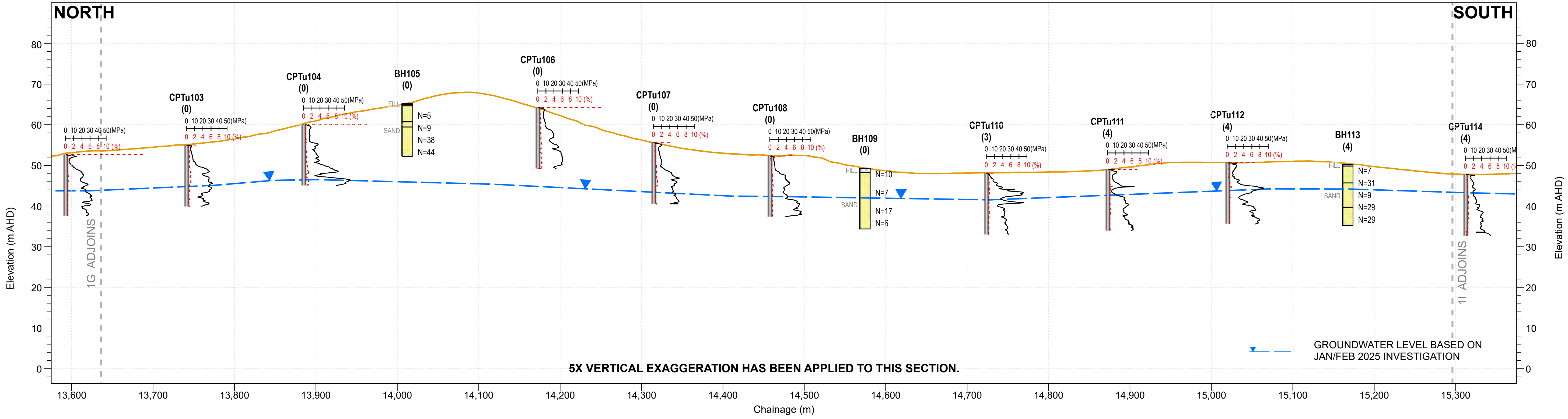
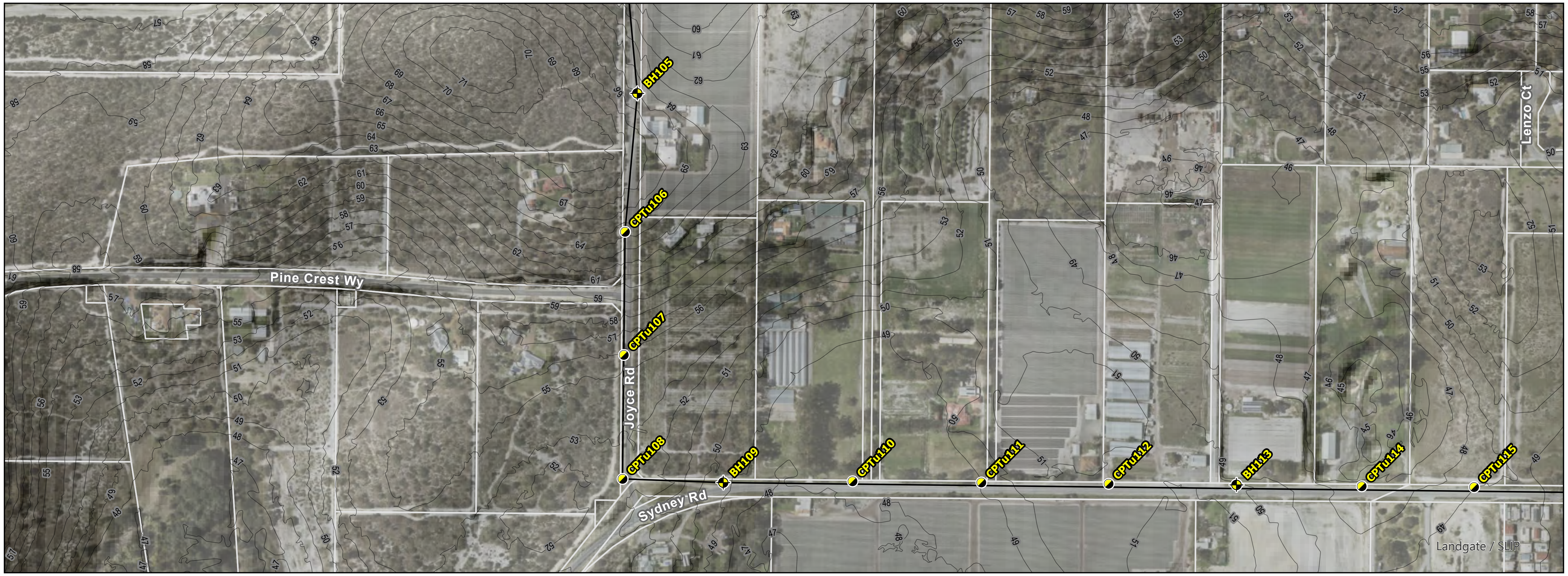
CMW Geosciences

CLIENT: **ACCIONA**
PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**
TITLE: **GEOLOGICAL SECTION A-A'**
COMPILED: SR
CHECKED: LSW
REVISION: 0
DATE: 7/04/2026
PROJECT: PER2025-0250
FIGURE: 1G
SCALE: H 1:5,000 V 1:1000
SHEET: A3 L





LITHOLOGY UNIT

▨ FILL

🟨 SAND

CPT LOCATION

CONE RESISTANCE - QC (MPA)

FRICTION RATIO - RF (%)

GROUND SURFACE

MACHINE BOREHOLE

CONE PENETRATION TEST

NOTES

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CMW Geosciences

CLIENT: **ACCIONA**

PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**

TITLE: **GEOLOGICAL SECTION A-A'**

COMPILED: SR

CHECKED: LSW

REVISION: 0

DATE: 7/04/2026

PROJECT: PER2025-0250

FIGURE: 1H

SCALE: H 1:5,000
V 1:1000

SHEET: A3 L

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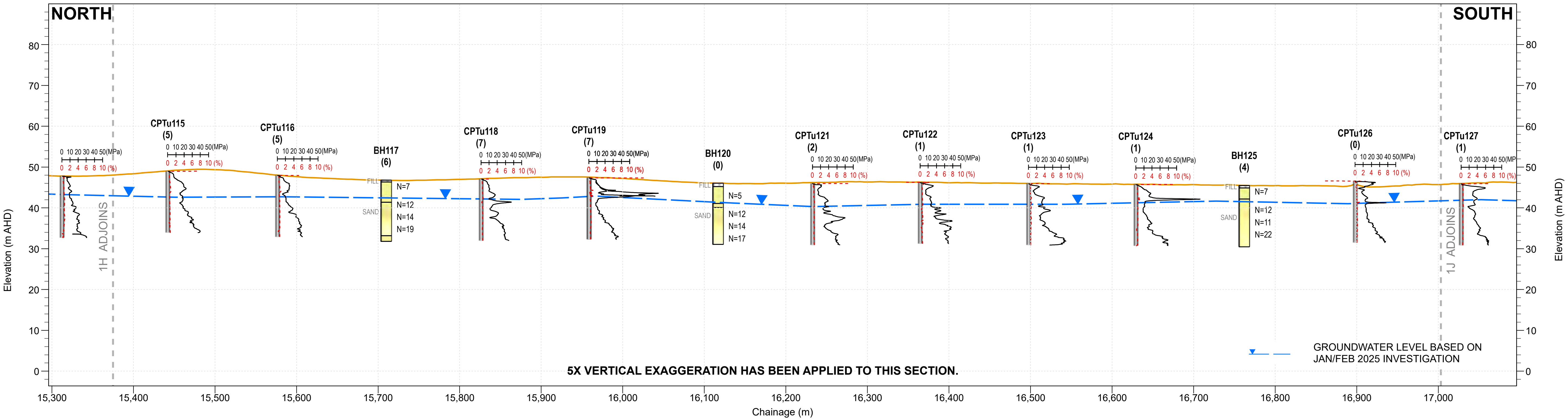

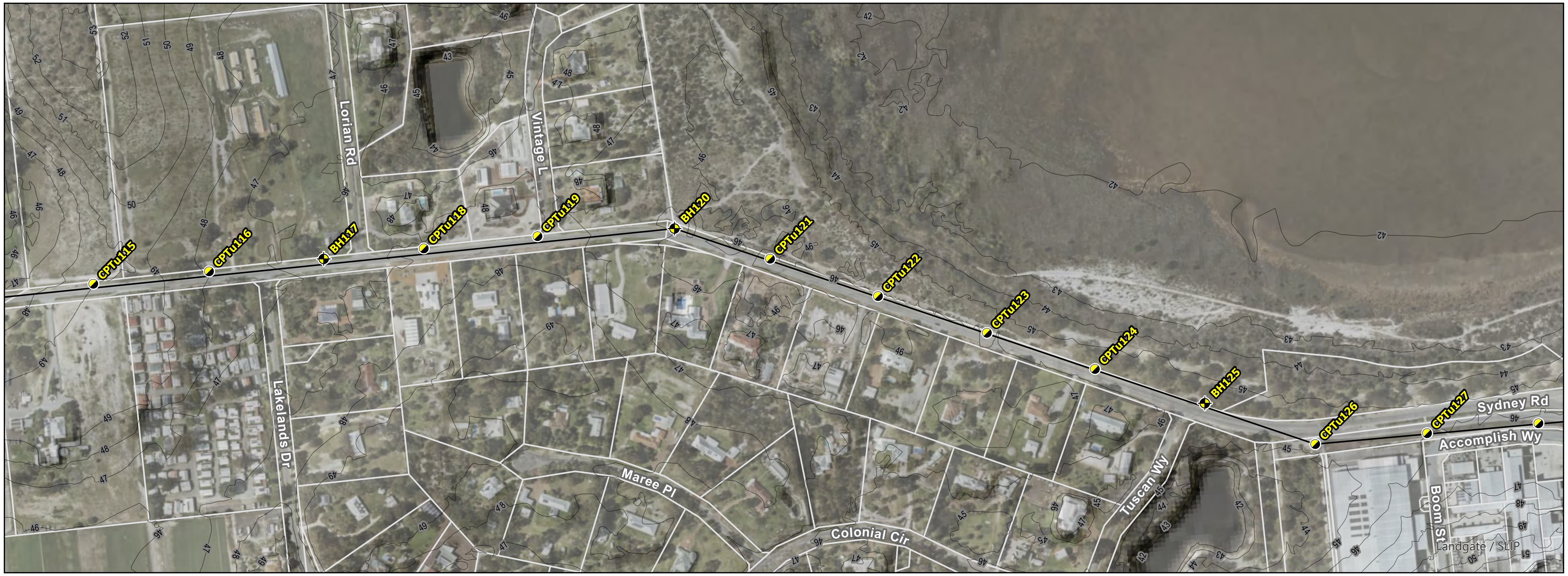

LITHOLOGY UNIT

▨ FILL

🟨 SAND

CPT LOCATION

CONE RESISTANCE - QC (MPA)

FRICTION RATIO - RF (%)

GROUND SURFACE

MACHINE BOREHOLE

CONE PENETRATION TEST

NOTES

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CMW Geosciences

CLIENT: **ACCIONA**

PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**

TITLE: **GEOLOGICAL SECTION A-A'**

COMPILED: SR

CHECKED: LSW

REVISION: 0

DATE: 7/04/2026

PROJECT: PER2025-0250

FIGURE: 1I

SCALE: H 1:5,000 V 1:1000

SHEET: A3 L

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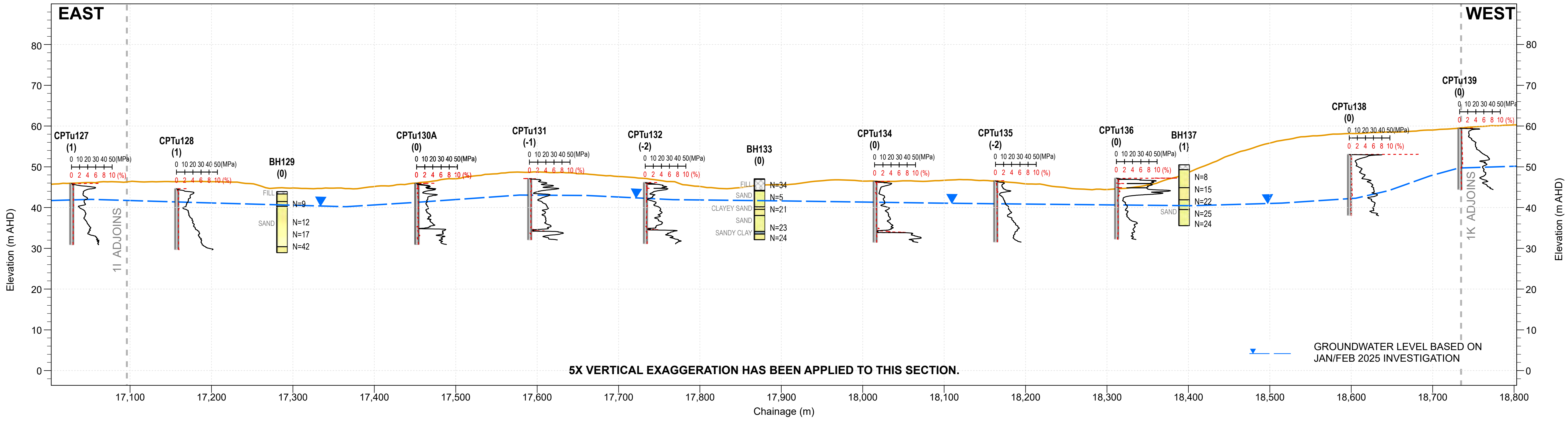

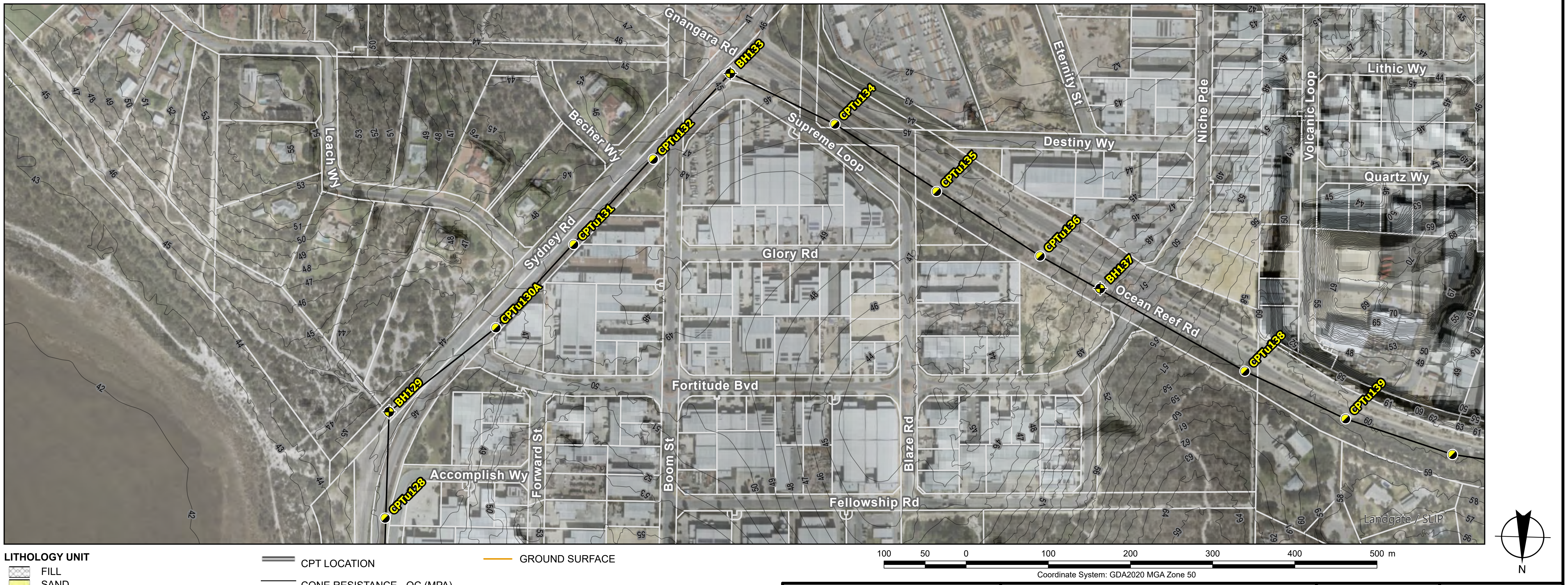

LITHOLOGY UNIT

▨	FILL
🟨	SAND
🟨	CLAYEY SAND
🟦	SANDY CLAY

⊕	MACHINE BOREHOLE
●	CONE PENETRATION TEST

═	CPT LOCATION
—	CONE RESISTANCE - QC (MPA)
- - -	FRICTION RATIO - RF (%)
—	GROUND SURFACE

NOTES

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CMW Geosciences

CLIENT: **ACCIONA**		COMPILED: SR	PROJECT: PER2025-0250
PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**		CHECKED: LSW	FIGURE: 1J
		REVISION: 0	SCALE: H 1:5,000 V 1:1000
TITLE: **GEOLOGICAL SECTION A-A'**		DATE: 7/04/2026	SHEET: A3 L

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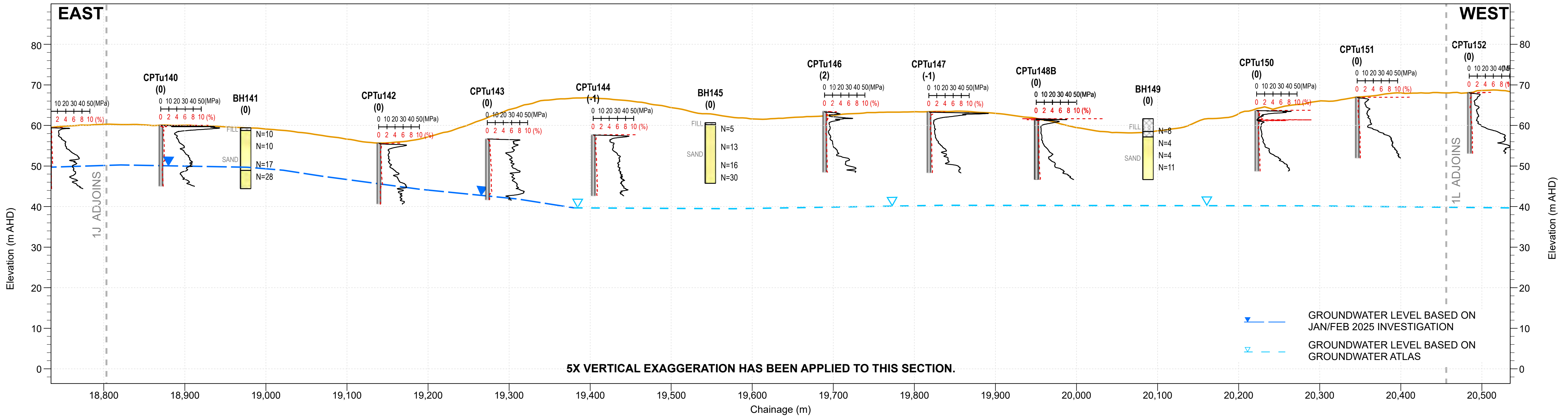

100 50 0 100 200 300 400 500 m

Coordinate System: GDA2020 MGA Zone 50

N

LITHOLOGY UNIT

▨ FILL

🟨 SAND

CPT LOCATION

CONE RESISTANCE - QC (MPA)

FRICTION RATIO - RF (%)

GROUND SURFACE

⊕ MACHINE BOREHOLE

◐ CONE PENETRATION TEST

NOTES

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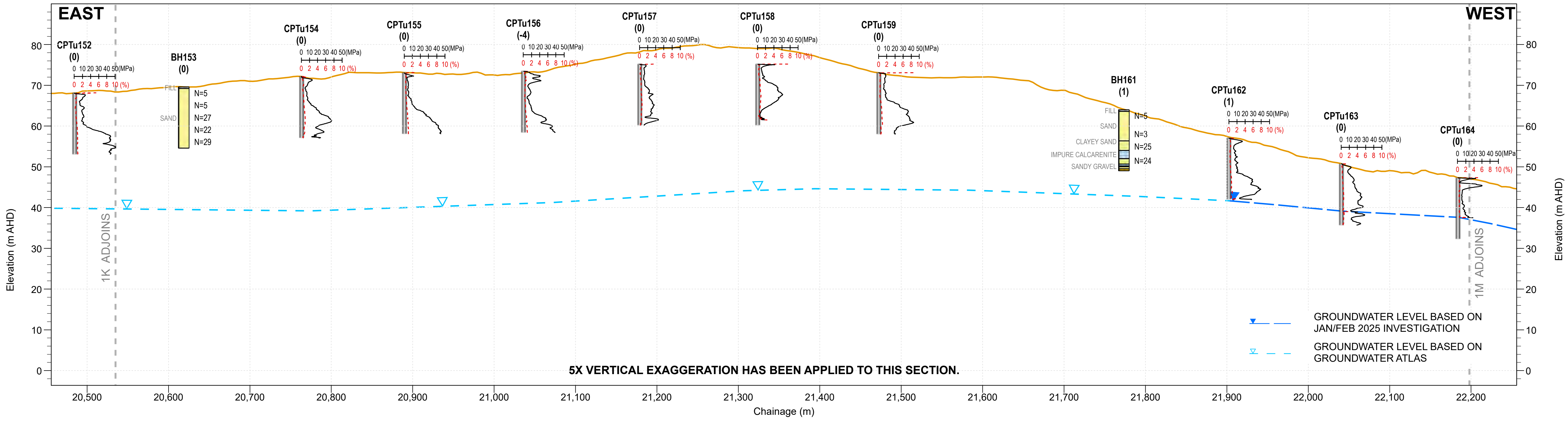
CMW Geosciences

CLIENT: **ACCIONA**	COMPILED: SR	PROJECT: PER2025-0250
PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**	CHECKED: LSW	FIGURE: 1K
	REVISION: 0	SCALE: H 1:5,000 V 1:1000
TITLE: **GEOLOGICAL SECTION A-A'**	DATE: 7/04/2026	SHEET: A3 L



GROUNDWATER LEVEL BASED ON JAN/FEB 2025 INVESTIGATION

GROUNDWATER LEVEL BASED ON GROUNDWATER ATLAS

5X VERTICAL EXAGGERATION HAS BEEN APPLIED TO THIS SECTION.

100 50 0 100 200 300 400 500 m

Coordinate System: GDA2020 MGA Zone 50

N

LITHOLOGY UNIT

▨	FILL
🟨	SAND
🟨	CLAYEY SAND
🟨	GRAVELLY SAND
🟧	SANDY GRAVEL
🟦	IMPURE CALCARENITE
⊕	MACHINE BOREHOLE
●	CONE PENETRATION TEST

▬	CPT LOCATION
—	CONE RESISTANCE - QC (MPA)
- - -	FRICTION RATIO - RF (%)
—	GROUND SURFACE

NOTES

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CMW Geosciences

CLIENT: **ACCIONA**

PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**

TITLE: **GEOLOGICAL SECTION A-A'**

COMPILED: SR

CHECKED: LSW

REVISION: 0

DATE: 7/04/2026

PROJECT: PER2025-0250

FIGURE: 1L

SCALE: H 1:5,000 V 1:1000

SHEET: A3 L

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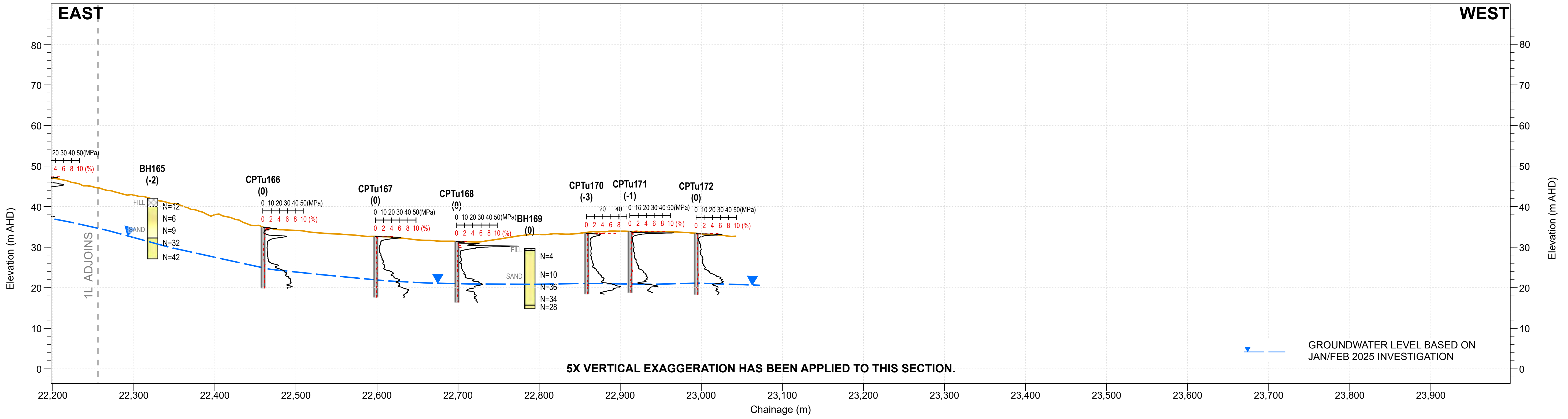

5X VERTICAL EXAGGERATION HAS BEEN APPLIED TO THIS SECTION.

100 50 0 100 200 300 400 500 m

Coordinate System: GDA2020 MGA Zone 50

LITHOLOGY UNIT

▨ FILL

🟨 SAND

CPT LOCATION

CONE RESISTANCE - QC (MPA)

FRICTION RATIO - RF (%)

GROUND SURFACE

MACHINE BOREHOLE

CONE PENETRATION TEST

NOTES

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CMW Geosciences

CLIENT: **ACCIONA**	COMPILED: SR	PROJECT: PER2025-0250
PROJECT: **CLEAN ENERGY LINK NORTH PROJECT DOUBLE CIRCUIT**	CHECKED: LSW	FIGURE: 1M
	REVISION: 0	SCALE: H 1:5,000 V 1:1000
TITLE: **GEOLOGICAL SECTION A-A'**	DATE: 7/04/2026	SHEET: A3 L

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APPENDIX B

Borehole Logs

Table B.1: Summary of Borehole Details

Location ID	MGA 2020 Zone 50[1]		Surface Elevation[2] (m AHD)	Termination Depth (m bgl)	Termination Reason
	Easting (m)	Northing (m)			
BH17	390366.12	6494162.66	56.6	15.0	Target Depth
BH21	390377.49	6493581.32	60.1	15.0	Target Depth
BH25	390352.00	6493021.00	53.6	15.0	Target Depth
BH31	391069.00	6492621.00	54.7	15.0	Target Depth
BH37	391082.60	6491776.60	54.4	15.0	Target Depth
BH41	391092.00	6491221.50	53.1	15.0	Target Depth
BH45	391034.61	6490651.04	53.0	14.4	Equipment Refusal
BH49	391005.67	6490079.92	54.3	15.0	Target Depth
BH53	391112.93	6489630.40	54.7	15.0	Target Depth
BH57	391219.00	6489245.00	52.1	15.0	Target Depth
BH61	391240.60	6488725.50	49.3	14.0	Equipment Refusal
BH65	391383.00	6488198.00	52.8	15.0	Target Depth
BH69	391971.00	6488098.00	63.9	15.0	Target Depth
BH69b	391971.55	6488099.67	63.9	15.0	Target Depth
BH73	392543.00	6488029.00	60.9	15.0	Target Depth
BH77	393115.00	6487951.00	60.3	14.45	Equipment Refusal
BH81	393266.95	6487523.19	53.0	15.0	Target Depth
BH86	393278.00	6486780.00	58.7	14.95	Target Depth
BH89	393302.00	6486354.00	59.2	15.0	Target Depth
BH93	393293.00	6485756.00	56.1	15.0	Target Depth
BH105	393041.18	6485042.28	65.2	13.0	Equipment Refusal
BH109	392593.92	6484934.52	49.3	14.95	Target Depth
BH113	392602.45	6484341.42	50.2	14.95	Target Depth
BH117	392608.40	6483798.99	46.8	15.0	Target Depth
BH120	392605.00	6483392.00	46.0	15.0	Target Depth
BH125	392346.00	6482801.00	45.5	15.0	Target Depth
BH129	392285.15	6482289.91	43.9	15.0	Target Depth
BH133	391881.00	6481867.00	47.1	14.5	Equipment Refusal
BH137	391424.00	6482117.00	50.5	14.95	Target Depth
BH141	390886.00	6482320.00	59.4	15.0	Target Depth
BH145	390313.00	6482333.00	60.7	15.0	Target Depth
BH149	389774.00	6482363.00	61.7	15.0	Target Depth

Location ID	MGA 2020 Zone 50[1]		Surface Elevation[2] (m AHD)	Termination Depth (m bgl)	Termination Reason
	Easting (m)	Northing (m)			
BH153	389276.00	6482463.00	69.6	15.0	Target Depth
BH161	388155.90	6482683.89	64.0	15.0	Target Depth
BH165	387630.00	6482795.00	42.1	14.95	Target Depth
BH169	387184.87	6482928.95	29.7	14.9	Target Depth
BH173	387204.00	6482883.00	30.0	15.0	Target Depth

Notes: 1: Investigation locations were surveyed and co-ordinates provided by Acciona
2: Surface Elevations were surveyed and provided by Acciona

Explanatory Notes – Soil Description

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GRAVEL

SILTY GRAVEL

CLAYEY GRAVEL

Sandy GRAVEL

SAND

Gravelly SAND

SILTY SAND

CLAYEY SAND

CLAY

Gravelly CLAY

Sandy CLAY

SILT

Gravelly SILT

Sandy SILT

PEAT

FILL

TOPSOIL

COBBLES & BOULDERS

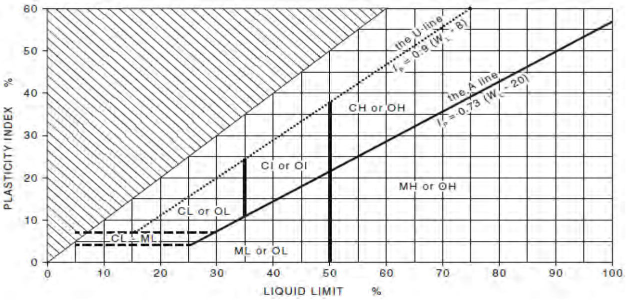
CONCRETE

NO CORE

GP	Poorly Graded Gravel	ML	Low Plasticity Silt
GW	Well Graded Gravel	MH	High Plasticity Silt
GM	Silty Gravel	CL	Low Plasticity Clay
GC	Clayey Gravel	CI	Medium Plasticity Clay
SP	Poorly Graded Sand	CH	High Plasticity Clay
SW	Well Graded Sand	OL	Organic Soils (LP)
SM	Silty Sand	OH	Organic Soils (HP)
SC	Clayey Sand	PT	Peat
	Fill		Cobbles & Boulders

Soil colours based on BGS Internal report IR/05/123 "A Revised scheme for coding unlithified deposits", 2006.

WATER	
▼ Groundwater (Strike)	▽ Groundwater (rise)



CLASSIFICATION AND INFERRED STRATIGRAPHY

Particle Size		
Major Division	Sub Division	Particle Size
Boulders		> 200 mm
Cobbles		63 to 200 mm
Gravel	Coarse	19 to 63 mm
	Medium	6.7 to 19 mm
	Fine	2.36 to 6.7 mm
Sand	Coarse	0.6 to 2.36 mm
	Medium	0.21 to 0.6 mm
	Fine	0.075 to 0.21 mm
Silt		0.002 to 0.075 mm
Clay		< 0.002 mm

SECONDARY/MINOR COMPONENTS	
TERMS FOR SANDS/GRAVELS (Less than 35% Particles < 0.075mm)	**TERMS FOR CLAYS/SILTS** (More than 35% Particles < 0.075mm)
trace… sand/gravel = <15% clay/silt = <5%	**trace…** sand/gravel = <15%
with… sand/gravel = >15%, <30% clay/silt = >5%, <12%	**with…** sand/gravel = >15%, <30%
Sandy… / Gravelly… >30%	**Sandy… / Gravelly…** >30%
Clayey… / Silty … >12%	

MOISTURE CONDITION (Cohesionless Soils)

Symbol	Term	Description
D	**Dry**	Looks and feels dry. Cohesionless and free-running.
M	**Moist**	No free water on remoulding. Soil feels cool, darkened in colour. Soil tends to cohere.
W	**Wet**	Free water on remoulding. Soil feels cool, darkened in colour. Soil tends to cohere.

MOISTURE CONDITION (Cohesive Soils)

Symbol	Term	Description
<PL	**Dry**	Looks and feels dry. Hard and friable or powdery, well dry of the plastic limit
≈PL	**Moist**	Soil feels cool, darkened in colour. Soil can be moulded. Near plastic limit.
>PL	**Wet**	Soils feels cool, darkened in colour. Usually weakened and free water forms when remoulding. Wet of plastic limit.

DENSITY (Cohesionless Soils)

Sym.	Term	Density Index (%)	SPT 'N'
VL	Very Loose	Less than 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Dense	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

STIFFNESS (Cohesive Soils)

Sym.	Term	Undrained Shear Strength
VS	Very Soft	0 to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa

SAMPLING AND LABORATORY / INSITU TESTING RESULTS

B	Bulk Disturbed Sample	**U**	Undisturbed Push-in Sample	**CBR**	California Bearing Ratio
BLK	Block Sample	**W**	Water Sample	**UCS**	Unconfined Compressive Strength
C	Core Sample	**LL**	Liquid Limit	**PLI**	Point Load Index
ES	Environmental Soil Sample	**PI**	Plasticity Index	**N**	SPT-N Value
P	Piston Sample	**LS**	Linear Shrinkage		

DRILLING/EXCAVATION METHOD

AC	Air Core	**HA**	Hand Auger	**RC**	Rotary Cored
ADH	Hollow Auger Drilling	**HQ**	Rotary Core 63.5mm	**RO**	Rotary Open Hole
AD/V	Auger with V-Bit	**HQ3**	Rotary Core 61.1mm	**SPT**	Standard Penetration Test
AD/T	Auger with TC-Bit	**PQ3**	Rotary Drill 83mm	**TP**	Test Pit
DPP	Direct Push Probe	**PT**	Push Tube	**W**	Wash Bore

Explanatory Notes – Rock Description

▤ **MUDSTONE**
⊠ **SILTSTONE**
⁙ **SANDSTONE**
▦ **LIMESTONE**
▦ **CHALK**
△ **BRECCIA**
○ **CONGLOMERATE**
\+ **IGNEOUS**
≈ **METAMORPHIC**
◇ **GYPSUM**
▤ **SHALE**
▩ **PYROCLASTIC**

ROCK MATERIAL STRENGTH				
Symbol	**Term**	**Uniaxial Compressive Strength - UCS (MPa)**	**Point Load Index - $I_{s(50)}$ (MPa) - GUIDE ONLY**	**Field Guide**
EL	Extremely Low	Less than 0.6	Less than 0.03	Easily remoulded by hand to a material with soil properties (logged as soil).
VL	Very Low	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 3 cm thick can be broken by finger pressure.
L	Low	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	6 to 20	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	20 to 60	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
VH	Very High	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	More than 200	More than 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

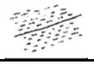
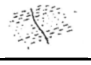
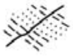
WEATHERING CLASSIFICATION		
Symbol	**Term**	**Definition**
RS	Residual Soil	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
XW	Extremely weathered rock	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
HW (or DW)	Highly Weathered	Rock strength usually changed by weathering. The rock may be highly discoloured. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
MW (or DW)	Moderately Weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable, but shows little or no change of strength from fresh rock.
SW	Slightly weathered rock	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
FR	Fresh rock	Rock shows no sign of decomposition or staining.

CEMENTATION CLASSIFICATION		
Symbol	**Term**	**Definition**
Uc	Uncemented	Clean grains, exhibiting soil properties.
VWc	Very weakly cemented	Marginal soil-rock strengths, collapsing feel under light finger pressure, cement seen on some washed grains.
Wc	Weakly Cemented	Collapsing feel under light soil pressure, breaks down to individual grains or with some grains cemented together, cement seen on many washed grains.
MWk	Moderately Weakly Cemented	Cement on nearly all grains, breaks down to lumps and some individual grains under finger pressure, can crush to individual grains under knife blade.
Mo	Moderately Cemented	Cement on most grains, can break fragments off by hand and crush to small lumps under knife blade.
We	Well Cemented	Practically all grains cemented together, cannot break fragments off by hand, dull sound under hammer.
VWe	Very Well Cemented	Most Primary Pores filled with cement, requires firm blow with hammer to break off fragments, rings when struck

ROCK CORE RECOVERY		
Symbol	**Term**	**Definition**
TCR	Total Core Recovery (%)	The ratio of total length of core recovered to length of core run drilled, expressed as a percentage.
SCR	Solid Core Recovery (%)	The ratio of the total length of solid cylindrical pieces of core recovered to length of core run drilled, expressed as a percentage.
RQD	Rock Quality Designation (%)	The ratio of the total length of solid cylindrical pieces of core over 100mm in length recovered to length of core run drilled, expressed as a percentage.

Explanatory Notes – Defect Description

Defect Type

ABBREVIATION	TERM	DEFINITION	DIAGRAM
PT	**Parting**	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.	
JT	**Joint**	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed.	
SS	**Sheared Surface**	A near planar, curved or undulating surface which is usually smooth, polished or slickensided and which shows evidence of shear displacement.	
SZ	**Sheared Zone**	Zone of rock material with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge-shaped blocks.	
CS	**Crushed Zone / Seam**	Seam of soil material with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock material which may be more weathered than the host rock. The seam has soil properties.	
SM	**Seam**	Seam of soil material usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1 mm thick may be described as a veneer or coating on a joint surface.	

Surface Roughness

ABBREVIATION	TERM	Description
VR	**Very Rough**	Many large irregularities generally > 1 mm
RO	**Rough**	Many small irregularities generally > 1 mm
SM	**Smooth**	Few or no surface irregularities
PO	**Polished**	Shiny smooth surface
Sl	**Slickensided/Striated**	Grooved/striated surface, usually polished

Orientation

ABBREVIATION	TERM
SH	**Sub Vertical**
SV	**Sub Horizontal**
10°	**Angle from horizontal**

Surface Shape

ABBREVIATION	TERM	Description
PL	**Planar**	Does not vary in orientation
CU	**Curved**	gradual change in orientation
UN	**Undulating**	wavy surface
ST	**Stepped**	one or more well defined steps
IR	**Irregular**	many sharp changes in orientation

Aperture

ABBREVIATION	TERM
DIS	**Discontinuous**
CL	**Closed**
5mm	**Measured width between joint surfaces**

Coatings

ABBREVIATION	TERM	Description
CN	**Clean**	No visible coating
SN	**Stained**	No coating but surface discoloured
VN	**Veneer**	visible coating too thin to measure
CT	**Coating**	visible coating up to 1mm thick
IF	**Infilled**	Over 1mm thick of soil present

Block Shape

Term	Description
Blocky	Roughly equidimensional blocks.
Tabular	thickness of blocks much less than length or width.
Columnar	lengths much greater than other dimensions
Irregular	Irregular discontinuities without arrangement into distinct sets,

BOREHOLE LOG - BH17

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 16/02/2026

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Sheet 1 of 1

Logged by: NB	Position: E.390366m N.6494163m	Hole Diameter: 80mm	Plant: Geoprobe 7822DT
Checked by: AE	Elevation: 56.58 m	Angle from horizontal: 90°	Contractor: National Geotech

Drilling Method	Groundwater	Coring TCR	Coring SCR	Coring RQD	RL (m)	Depth (m)	Geological Unit	Graphic Log	Rock/Soil Description	Density/ Consistency	Moisture Condition	Rock Strength Classification VL L M H VH EH (6, 60; ● UCS (MPa); ✕ Correlated UCS (Is50))	Cementation/ Weathering	Defect Spacing (mm) <20 20-40 40-100 100-300 300-1000 >1000	Samples, test results and additional Data
HA					56.6	0.0	Fill	▨	FILL: Silty SAND: medium grained, sub-angular to sub-rounded, quartz and lithics; dark brown to grey-brown; trace gravel, fine grained, sub-angular to sub-rounded, quartz and calcium carbonate; with organics; trace roots.		D		Uc		
					56.2	0.4	Bassendean Sand		SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; white-grey; trace fines.	L					
SPT						1.5									1.5m:SPT: (2,2,3) N=5 Rec.=450mm
DPP						2.2			... at 2.20m, becoming brown grey to orange grey.						
						2.5					M				
SPT						3.0									3.0m:SPT: (2,4,4) N=8 Rec.=450mm
DPP						3.6			... at 3.60m, becoming grey to white grey.						
SPT						4.5									4.5m:SPT: (3,3,3) N=6 Rec.=450mm
DPP															
SPT						6.0				MD					6.0m:SPT: (4,6,8) N=14 Rec.=450mm
DPP															
SPT						7.5									7.5m:SPT: (3,4,6) N=10 Rec.=450mm
DPP	▼					8.0					W				
SPT						9.0									9.0m:SPT: (6,8,8) N=16 Rec.=450mm 9.45-11.00m: Coreloss
DPP															
SPT						10.5				MD to D					10.5m:SPT: (8,15,18) N=33 Rec.=450mm
DPP															
SPT						12.0									12.0m:SPT: (8,12,16) N=28 Rec.=450mm 12.45-13.50m: Coreloss
DPP															
SPT						13.5									13.5m:SPT: (5,8,12) N=20 Rec.=450mm 14.00-14.50m: Coreloss
DPP															
SPT						14.5									14.5m:SPT: (5,6,10) N=16 Rec.=450mm
						15			Borehole terminated at 14.95 m						

Termination reason: Target depth reached

Remarks: Borehole backfilled with arisings. Groundwater inferred from soil moisture content observed. Groundwater encountered at about 8.0 m.

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

CORE PHOTOGRAPH SHEET - BH17

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 16/02/2026

PER2025-0250
Project: Clean Energy Link North - Double Circuit
Client: Acciona
DATE OF PHOTOGRAPH: 16/02/2026
BOREHOLE NUMBER: BH17 STAGE 2
DEPTH (m): 0-5m TRAY: 1
SCALE: 0 5 10 15 20cm

PER2025-0250
Project: Clean Energy Link North - Double Circuit
Client: Acciona
DATE OF PHOTOGRAPH: 16/02/2026
BOREHOLE NUMBER: BH17 STAGE 2
DEPTH (m): 5-10m TRAY: 2
SCALE: 0 5 10 15 20cm

CORE PHOTOGRAPH SHEET - BH17

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 16/02/2026

BOREHOLE LOG - BH21

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 16/02/2026

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Logged by: NB	Position: E.390377m N.6493581m	Hole Diameter: 80mm	Plant: Geoprobe 7822DT
Checked by: AE	Elevation: 60.08 m	Angle from horizontal: 90°	Contractor: National Geotech

RL (m)	Depth (m)	Geological Unit	Rock/Soil Description	Density/ Consistency	Moisture Condition	Cementation/ Weathering
60.1	0.0	Topsoil	Silty SAND: medium grained, sub-angular to sub-rounded, quartz and lithics; dark brown to grey-brown; trace gravel, fine grained, sub-angular to sub-rounded, quartz and calcium carbonate; with organics; trace roots; trace fines.		D	
59.3	0.8	Sand Derived from: Tamala Limestone	SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; orange-grey to orange; trace fines.	L	D (to 3.0 m), M	
55.1	5	Bassendean Sand	SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; pale grey; trace fines. ... *at 9.00m, becoming grey brown.*	L (to 4.5 m), MD	M (to 11.0 m), W	Uc

Borehole terminated at 15.00 m

Drilling Method: HA (0–1.5 m); SPT, DPP alternating to 15 m

Groundwater: ▼ at about 11.0 m

Coring: TCR, SCR, RQD

Rock Strength Classification: VL L M H VH EH; 6, 60; ● UCS (MPa); × Correlated UCS (Is50)

Defect Spacing (mm): <20, 20-40, 40-100, 100-300, 300-1000, >1000

Samples, test results and additional Data:
- 1.5m:SPT: (2,3,3) N=6 Rec.=450mm
- 3.0m:SPT: (2,2,3) N=5 Rec.=450mm
- 4.5m:SPT: (4,5,6) N=11 Rec.=450mm
- 6.0m:SPT: (3,4,7) N=11 Rec.=450mm
- 7.5m:SPT: (4,6,8) N=14 Rec.=450mm
- 9.0m:SPT: (5,8,9) N=17 Rec.=450mm
- 10.5m:SPT: (3,5,6) N=11 Rec.=450mm
- 12.0m:SPT: (3,4,6) N=10 Rec.=450mm
- 13.5m:SPT: (5,6,8) N=14 Rec.=450mm

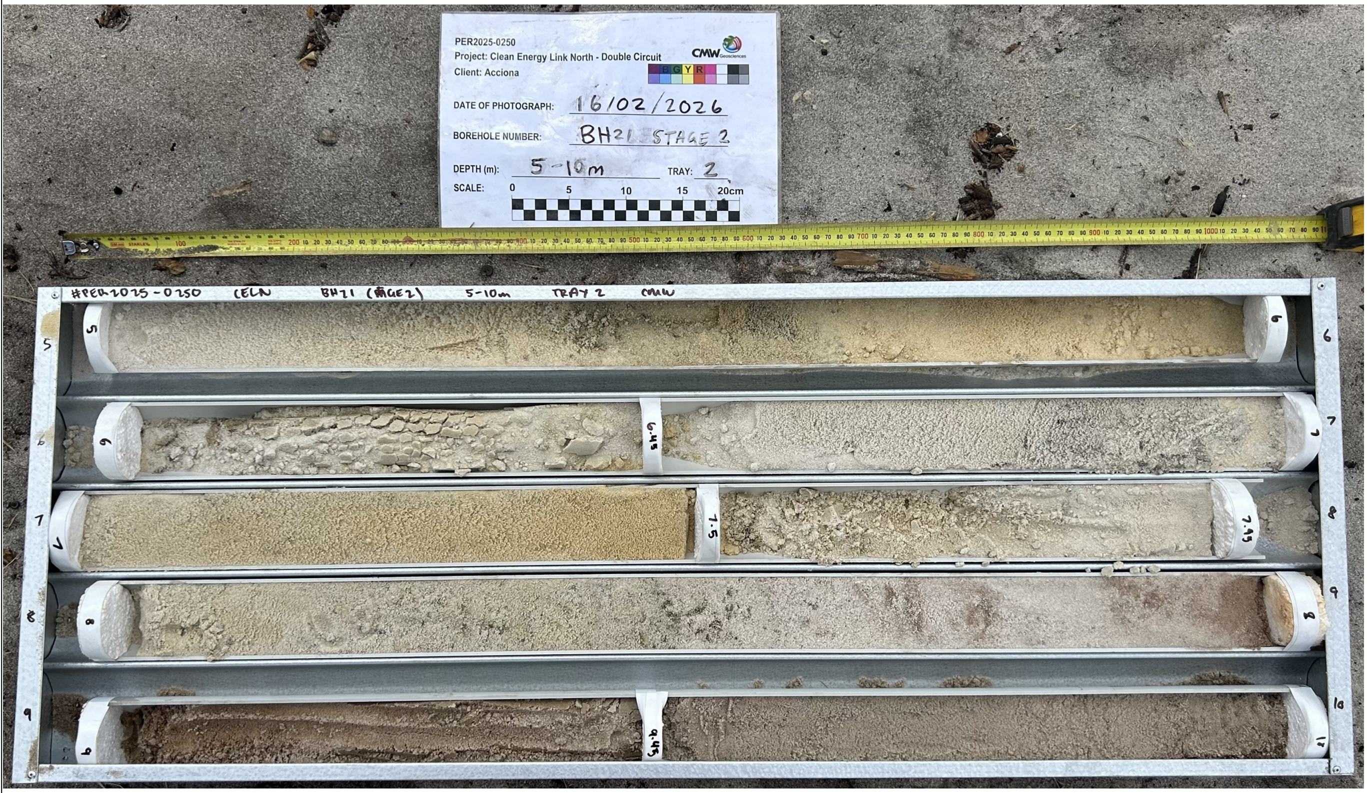
Termination reason: Target depth reached

Remarks: Borehole backfilled with arisings. Groundwater inferred from soil moisture content observed. Groundwater encountered at about 11.0 m. Groundwater monitoring well installed to 14.0 m. 0.5 m stickup, slotted interval between 11.0 m and 14.0 m.

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

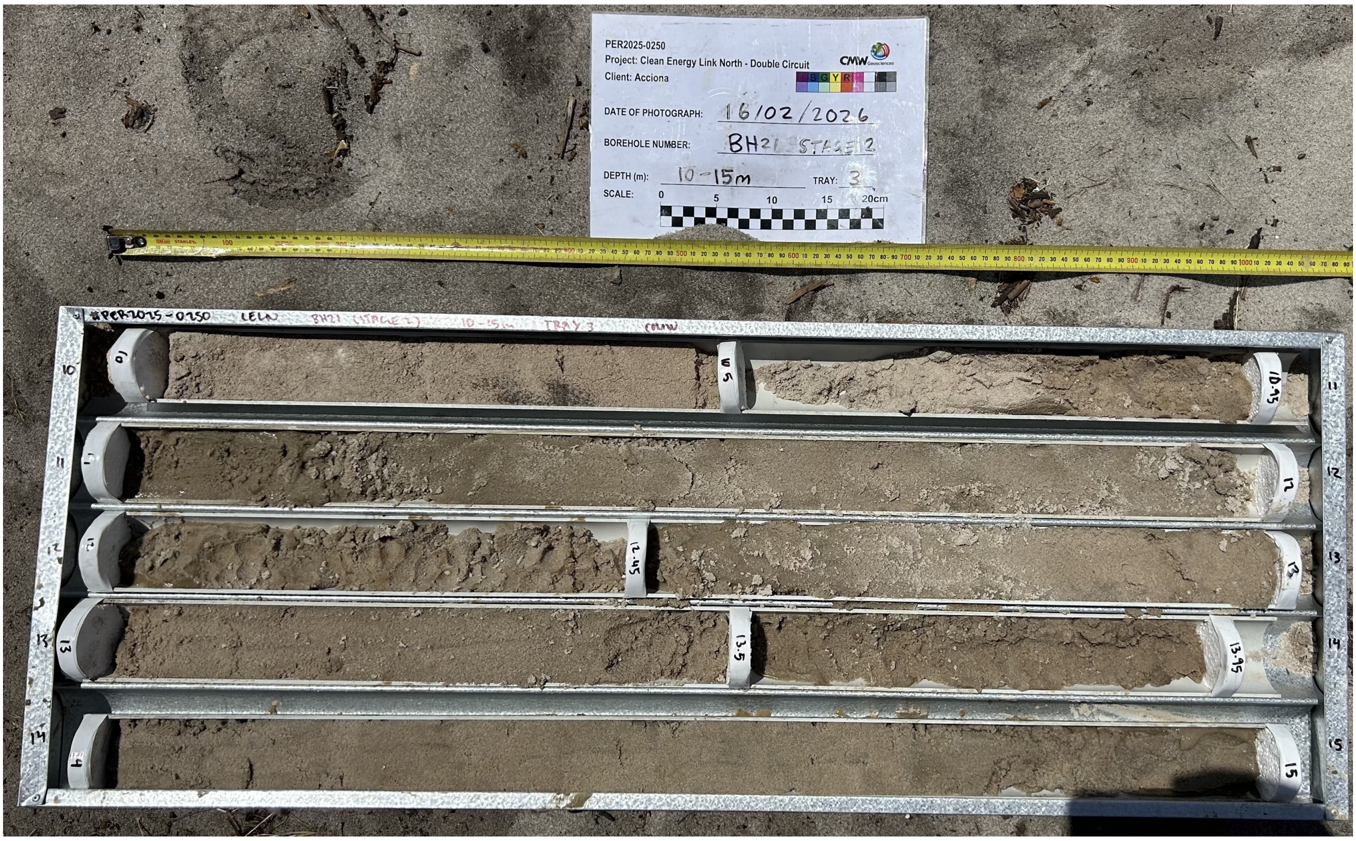
CORE PHOTOGRAPH SHEET - BH21

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 16/02/2026



CORE PHOTOGRAPH SHEET - BH21

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 16/02/2026



PER2025-0250
Project: Clean Energy Link North - Double Circuit
Client: Acciona

DATE OF PHOTOGRAPH: 16/02/2026
BOREHOLE NUMBER: BH21 STAGE 2
DEPTH (m): 10-15m
TRAY: 3

BOREHOLE LOG - BH25

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 16/02/2026

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Sheet 1 of 1

Logged by: NB
Checked by: AE

Position: E.390352m N.6493021m
Elevation: 53.58 m

Hole Diameter: 80mm
Angle from horizontal: 90°

Plant: Geoprobe 7822DT
Contractor: National Geotech

Rock Strength Classification: VL L M H VH EH (6, 60); ● UCS (MPa); ✕ Correlated UCS (Is50)

Defect Spacing (mm): <20, 20-40, 40-100, 100-300, 300-1000, >1000

Drilling Method	Groundwater	Coring TCR	Coring SCR	Coring RQD	RL (m)	Depth (m)	Geological Unit	Rock/Soil Description	Density/ Consistency	Moisture Condition	Rock Strength Classification	Cementation/ Weathering	Defect Spacing (mm)	Samples, test results and additional Data
HA					53.6		Fill	FILL: Gravelly SAND: fine grained, sub-angular to sub-rounded, quartz and lithics; orange-brown to brown; gravel, medium grained, sub-angular to sub-rounded, quartz and carbonate; trace fines.						
					53.4		Topsoil	BURIED TOPSOIL: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; dark brown-grey; trace fines.						
					53.1		Bassendean Sand	SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; pale brown-grey; trace fines.						
						1				D				
SPT														1.5m:SPT: (2,3,3) N=6 Rec.=450mm
DPP						2						Uc		
SPT						3			L to MD	M				3.0m:SPT: (4,5,5) N=10 Rec.=450mm
DPP						4								
SPT					49.3		Duricrust	SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; dark brown to brown; trace fines. (Grade DIII)				Wk		4.5m:SPT: (2,3,3) N=6 Rec.=450mm
DPP	▼				48.6	5	Bassendean Sand	SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; pale brown-grey to grey-brown; trace fines.						
SPT						6								6.0m:SPT: (3,5,7) N=12 Rec.=450mm
DPP						7								
SPT														7.5m:SPT: (5,8,9) N=17 Rec.=450mm
DPP						8								
SPT						9								9.0m:SPT: (5,6,11) N=17 Rec.=450mm
								... at 9.45m, becoming pale grey to grey.						
DPP						10				W		Uc		
SPT									MD					10.5m:SPT: (3,5,9) N=14 Rec.=450mm
DPP						11								
SPT						12								12.0m:SPT: (5,8,8) N=16 Rec.=450mm
DPP						13								
SPT														13.5m:SPT: (3,4,9) N=13 Rec.=450mm
DPP						14								
						15		Borehole terminated at 15.00 m						

Termination reason: Target depth reached

Remarks: Borehole backfilled with arisings. Groundwater inferred from soil moisture content observed. Groundwater encountered at about 5.0 m.

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

CORE PHOTOGRAPH SHEET - BH25

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 16/02/2026

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CORE PHOTOGRAPH SHEET - BH25

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 16/02/2026

BOREHOLE LOG - BH31

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 19/02/2026

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Sheet 1 of 1

Logged by: NB	Position: E.391069m N.6492621m	Hole Diameter: 80mm	Plant: Geoprobe 7822DT
Checked by: AE	Elevation: 54.68 m	Angle from horizontal: 90°	Contractor: National Geotech

Coring: TCR, SCR, RQD

Rock Strength Classification: VL L M H VH EH; 6, 60; ● UCS (MPa); ✕ Correlated UCS (Is50)

Defect Spacing (mm): <20, 20-40, 40-100, 100-300, 300-1000, >1000

RL (m)	Geological Unit	Graphic Log	Rock/Soil Description	Density/ Consistency	Moisture Condition	Cementation/ Weathering
54.7	Fill	▨	FILL: SAND: medium grained, sub-angular to sub-rounded, quartz; dark grey; trace gravel, fine grained, angular to sub-angular, quartz and carbonate; trace roots; trace wood fragments; trace fines.			
54.3	Bassendean Sand		SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; brown-grey to grey; trace fines.	L to MD	D M	Uc
51.8	Duricrust		SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; dark brown to brown; trace fines. (Grade DIII)		M	Wk
50.1	Bassendean Sand		SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; brown-grey to grey; trace fines. *... at 9.45m, becoming pale grey to pale brown grey.*		M W	Uc

Groundwater: ▼ at about 5.0 m

Drilling Method	Samples, test results and additional Data
HA	
SPT	1.5m:SPT: (3,4,5) N=9 Rec.=450mm
DPP	
SPT	3.0m:SPT: (15,15,15) N=30 Rec.=450mm
DPP	
SPT	4.5m:SPT: (3,5,9) N=14 Rec.=450mm
DPP	
SPT	6.0m:SPT: (2,5,8) N=13 Rec.=450mm
DPP	
SPT	7.5m:SPT: (3,4,4) N=8 Rec.=450mm
DPP	
SPT	9.0m:SPT: (3,6,7) N=13 Rec.=450mm
DPP	
SPT	10.5m:SPT: (4,8,12) N=20 Rec.=450mm
DPP	
SPT	12.0m:SPT: (6,12,13) N=25 Rec.=450mm
DPP	
SPT	13.5m:SPT: (4,6,10) N=16 Rec.=450mm
DPP	

Depth (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

Borehole terminated at 15.00 m

Termination reason: Target depth reached

Remarks: Borehole backfilled with arisings. Groundwater inferred from soil moisture content observed. Groundwater encountered at about 5.0 m.

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

CORE PHOTOGRAPH SHEET - BH31

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 19/02/2026

CORE PHOTOGRAPH SHEET - BH31

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 19/02/2026

PER2025-0250
Project: Clean Energy Link North - Double Circuit
Client: Acciona

DATE OF PHOTOGRAPH: 19/02/2026
BOREHOLE NUMBER: BH31 STAGE 2
DEPTH (m): 10-15m
TRAY: 3

BOREHOLE LOG - BH37

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 18/02/2026

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Sheet 1 of 1

Logged by: NB
Checked by: AE

Position: E.391083m N.6491777m
Elevation: 54.35 m

Hole Diameter: 80mm
Angle from horizontal: 90°

Plant: Geoprobe 7822DT
Contractor: National Geotech

Drilling Method	Groundwater	Coring TCR	Coring SCR	Coring RQD	RL (m)	Depth (m)	Geological Unit	Rock/Soil Description	Density/ Consistency	Moisture Condition	Rock Strength Classification VL L M H VH EH (6, 60; ● UCS (MPa) ✕ Correlated UCS (Is50))	Cementation/ Weathering	Defect Spacing (mm) <20 20-40 40-100 100-300 300-1000 >1000	Samples, test results and additional Data
HA					54.4		Topsoil	TOPSOIL: Silty SAND: fine to medium grained, sub-angular to sub-rounded, quartz; grey-brown; with roots; trace wood fragments.		D		Uc		
					53.8		Bassendean Sand	SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; brown-grey to grey; trace fines.	L					
						1				M				
SPT														1.5m:SPT: (2,2,3) N=5 Rec.=450mm
DPP						2								
					51.8		Duricrust	SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; dark brown to brown; trace fines. (Grade DIII)				Wk		
SPT					51.4	3	Bassendean Sand	SP: SAND: fine to medium grained, sub-angular to sub-rounded, quartz; brown-grey to grey; trace fines. *... from 3.60m to 4.50m, becoming brown.*				Uc		3.0m:SPT: (2,3,5) N=8 Rec.=450mm
DPP						4								
SPT														4.5m:SPT: (3,4,5) N=9 Rec.=450mm
DPP						5								
SPT	▼					6			MD	W				6.0m:SPT: (3,5,8) N=13 Rec.=450mm
DPP						7								
SPT														7.5m:SPT: (3,7,8) N=15 Rec.=450mm
DPP						8								
SPT						9								9.0m:SPT: (3,6,9) N=15 Rec.=450mm
DPP						10								
SPT														10.5m:SPT: (4,7,12) N=19 Rec.=450mm
DPP						11								
SPT						12								12.0m:SPT: (4,8,12) N=20 Rec.=450mm
DPP						13								
SPT														13.5m:SPT: (4,8,15) N=23 Rec.=450mm
DPP						14								
						15		Borehole terminated at 15.00 m						

Termination reason: Target depth reached

Remarks: Borehole backfilled with arisings. Groundwater inferred from soil moisture content observed. Groundwater encountered at about 6.0 m.

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

CORE PHOTOGRAPH SHEET - BH37

Client: Acciona
Project: Clean Energy Link North Project - Double Circuit
Location: Perth
Project ID: PER2025-0250
Date: 18/02/2026


PER2025-0250
Project: Clean Energy Link North - Double Circuit
Client: Acciona
DATE OF PHOTOGRAPH: 18/02/2026
BOREHOLE NUMBER: BH37 STAGE 2
DEPTH (m): 0-5m TRAY: 1
SCALE: 0 5 10 15 20cm


PER2025-0250
Project: Clean Energy Link North - Double Circuit
Client: Acciona
DATE OF PHOTOGRAPH: 18/02/2026
BOREHOLE NUMBER: BH37 STAGE 2
DEPTH (m): 5-10m TRAY: 2
SCALE: 0 5 10 15 20cm