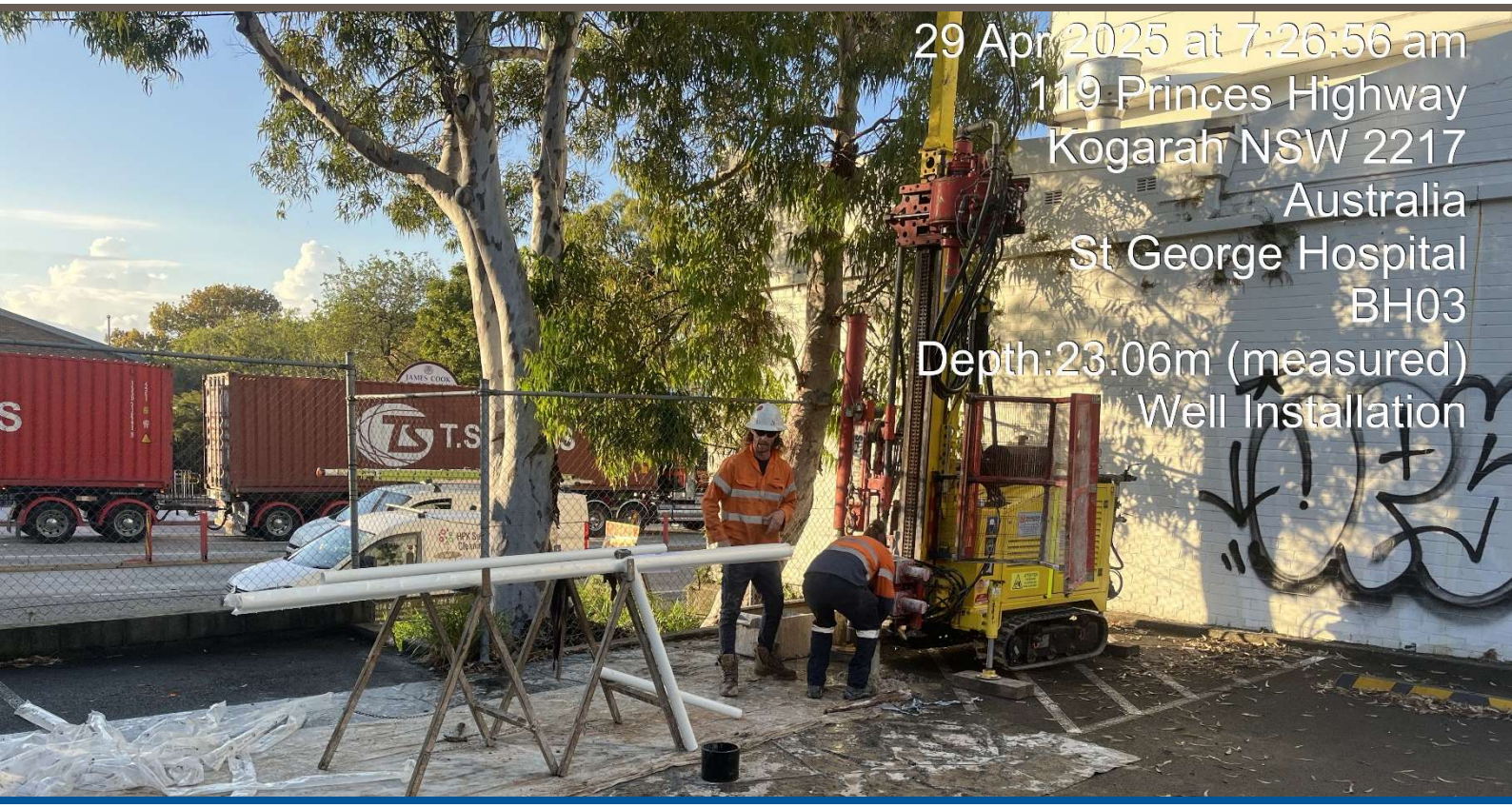
St George Private Hospital Expansion at 119 – 129 Princes Highway and 2 Hogben Street, Kogarah, and 1 South Street, Kogarah

Geotechnical Investigation Report

Akalan Projects Pty Ltd



Reference: SYDGE381816AA

22 October 2025

ST GEORGE PRIVATE HOSPITAL

Geotechnical Investigation Report

Report reference number: SYDGE381816AA
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1. INTRODUCTION

Tetra Tech Coffey Pty Ltd (Tetra Tech Coffey) was engaged by Akalan Projects Pty Ltd to prepare this Geotechnical Investigation Report (GIR) in support of a State Significant Development Application (SSDA) submitted to the Department of Planning, Housing and Infrastructure (DPHI) under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act 1979).

The SSDA seeks approval for the expansion of the St George Private Hospital. Specifically, the SSDA seeks consent for two components: the first being the construction of a health services facility (clinical tower), and the second relating to upgrades to the main hospital campus, including a new emergency department.

This report covers the proposed clinical tower site works only and excludes the main hospital campus. Fieldwork investigations were not necessary for the proposed main hospital upgrade works as these works do not require substantial ground works and largely relate to ground level layout alterations.

This report presents the results of geotechnical investigation and provides advice and recommendations for the proposed health services facility (hospital) including the following:

- Site description and site photos.
- Investigation procedure and methodology.
- Regional geology and the encountered conditions at the borehole locations.
- A preliminary geotechnical/ground model for the development site.
- Groundwater conditions and design water table.
- Initial comments on relevant geotechnical structures including building footings and foundations, excavation conditions, retaining structures and dewatering (as appropriate).
- Recommendations for further intrusive geotechnical site investigations and strategies to support detailed planning and engineering design.
- Likelihood of encountering Acid Sulfate Soils.
- Comments on the potential of geohazards (i.e. landslip, erosion, instability).
- Potential interaction issues with adjacent existing infrastructure.
- Identification and discussion of perceived geotechnical issues and constraints for the site development.

The Groundwater Impact Assessment for this project is provided in a separate report (Ref: SYDGE381816AB, dated 20 June 2025).

The Preliminary Site Investigation (PSI) prepared for this project is provided in a separate report (Ref: SYDGE381816AC, dated 20 June 2025).

2. SEARS RELEVANT TO THIS REPORT

This report has been prepared to respond to the SEARs issued for the St George Private Hospital Expansion project. The SEARs relevant to this geotechnical investigation report are detailed in Table 1.

Table 1: SEARs for Geotechnical

Issue and assessment requirements	Documentation	Response
13. Ground and Water Conditions **Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site, including soil erosion, salinity, and acid sulfate soils.**	Geotechnical Investigation Report Salinity Management Plan and/or Acid Sulphate Soils Management Plan	This SEARs requirement is addressed by this Geotechnical Investigation Report. which provides the results of intrusive ground investigation and provides recommendations for the proposed development. Acid Sulphate Soils nor Salinity Management Plans are not considered to be required for this submission.

3. SITE INFORMATION

The site is in the Georges River Local Government Area (LGA), within the Kogarah town centre.

3.1 SITE DESCRIPTION AND LOCALITY

Clinical Tower Site

The proposed new health services facility (hospital) will be located on land that is bound by three road frontages, being Princes Highway to the east (a classified road), Hogben Street to the north, and Bank Lane to the west. This site comprises eight adjoining allotments of land, known as 119 – 129 Princes Highway, Kogarah, and 2 Hogben Street, Kogarah.

The site currently accommodates a hard-stand parking lot, providing approximately 76 car parking spaces and a two-storey commercial premises (subject to separate demolition), which is attached to the existing multi-storey health services facility at 2 South Street, Kogarah.

The site comprises Lots A-C DP358876 and Lots 1-5 DP8864 and is approximately rectangular in shape with area of approximately 2,200 m^2 (refer to Figure A).

The site is adjoined to the south by an existing multi-storey health services facility, which forms part of the St George Private Hospital campus. South Street separates this facility from the main hospital campus, though a connecting sky-bridge provides pedestrian access between the buildings. Further west is the St George Public Hospital, and other surrounding development comprises a mix of commercial premises (typically at ground floor) and medium and high-density residential premises.

Main Hospital Campus

The existing hospital is located at 1 South Street, Kogarah which is also known as 1A South Street, Kogarah. This site is bound by two road frontages, being South Street to the north and Princes Highway (a classified road) to the east.

The site accommodates the St George Private Hospital's main campus, with vehicular access provided off South Street. Refer to **Error! Reference source not found.** for a site aerial excerpt.

Figure A: Site Aerial Extract (from Patch Planning and Development, 2025)

Figure B: Main Hospital Site Aerial Extract (from Patch Planning and Development, 2025)

3.2 TOPOGRAPHY

The site is flat across the entirety of the site.

3.3 PROPOSED DEVELOPMENT

The SSDA seeks approval for the expansion of the St George Private Hospital, seeking consent for two components: the first being the construction of a health services facility (hospital) at the site, and the second relating to upgrades to the main hospital campus, including a new emergency department.

In summary, approval for the following is sought for the site:

- Site preparation works and bulk earthworks, including tree clearing
- Construction of a seven (7) storey health services facility (hospital) equating to a total GFA of 9,952sqm
- Construction of a five (5) level basement carpark including a radiation oncology unit, providing a total of 241 parking spaces
- Ancillary office, amenities, and loading dock provisions
- Basement storage and a substation
- Landscaping works

The architectural plans for the proposed development are included in Appendix E.

3.4 LOCAL GEOLOGY

Reference to the Minview Surface Geological Mapping date indicates that the site is underlain by Triassic age Hawksbury Sandstone. Hawksbury sandstone comprises medium to coarse grained quartzose sandstone displaying small to large scale, high angle cross bedding with minor shale and laminite lenses.

Our previous geotechnical investigations for St George Hospital, including the neighbouring property indicate that the subsurface conditions of the site comprise fill overlying residual soil, overlying sandstone, which is consistent with the conditions indicated on the geology map.

Figure C: Regional geology of the site (Minview Surface Geological Map)

3.5 ACID SULFATE SOILS

With reference to the NSW government SEED (Sharing and Enabling Environmental Data) database, the proposed development is not located within the areas of the Acid Sulfate Soil Risk Map. The nearest known acid sulfate soils (Class H2) are located approximately 500m east of the subject site. Therefore any further requirements for production of an acid sulphate soils management plan is not considered to be required. See Figure D below for the site proximity to acid sulfate soil risk areas.

Figure D: SEED Acid Sulfate Hazard Map

4. FIELD INVESTIGATION

4.1 FIELDWORK

The borehole drilling was undertaken by Tetra Tech Coffey from 28 April to 1 May 2025 and comprised the following:

- Drilling of three (3) cored boreholes BH01 to BH03 up to a maximum depth of 23.22m below the existing ground surface.
- Installation of three (3) standpipe piezometers in each borehole for groundwater monitoring and testing.
- Conducting groundwater rising head tests within each standpipe on 7 May.

Boreholes BH01 to BH03 met their target depth of 23m, with final depths ranging from 23.09m to 23.22m below ground level.

Prior to any ground penetration, a Before You Dig Australia (BYDA) request was made for the subject site. Each borehole was compared with the BYDA plans and service located by an accredited service locator.

Unknown markers were detected during the use of Ground Penetrating Radar (GPR) during underground service location. To clear each borehole location from any unknown shallow services, each borehole was first excavated using a hand auger to 1.0-1.5m depth.

Each borehole was drilled using a track mounted drilling rig. Solid flight augers were used in soils up to TC bit refusal and continued using NMLC core drilling methods to a maximum depth of 23.22m. Where possible, Standard Penetration Tests (SPT) were undertaken at selected depths to assess soil strength and to obtain samples for logging and laboratory testing.

A Tetra Tech Coffey geotechnical engineer was present during fieldwork to identify drilling locations, record test results, log the encountered ground conditions and box the rock cores. The borehole logs and rock core photographs are attached in Appendix B together with Tetra Tech Coffey soil and rock description and explanation sheets.

Following completion of fieldwork, selected soil samples were sent to NATA accredited laboratory testing labs for testing, and the rock cores were sent to our core storage area for point load testing. The Point Load Index test results are included on the attached borehole logs in Appendix B.

4.2 STANDPIPES

A standpipe piezometer was installed in each of the boreholes (BH01 to BH03) to provide information on the existing groundwater level for basement design, and to allow rising head tests to be undertaken. All standpipes were screened from 16m to 22m depth below the existing ground level and completed with a flush mounted Gatic cover. After the piezometer standpipes were developed, groundwater level has been monitored using a HOBO datalogger since 14/05/2025. The HOBO will be removed after our final groundwater visit on 14/08/2025.

4.3 LABORATORY TESTING

On completion of fieldwork, selected soil samples from the boreholes were sent to the NATA accredited laboratory for laboratory testing. Table 2 below provides the testing schedule that Coffey submitted.

Table 2: Geotechnical laboratory testing schedule

Laboratory Testing	Quantities
Moisture Contents	3
Atterberg Limits and Linear Shrinkage	3
Particle Size Distribution (Hydrometer)	3
Soil aggressivity suite (pH, Sulphate, Chloride and Resistivity)	6
Rock Unconfined Compressive Strength (UCS) and Moisture Content	6
Rock UCS, Moisture Content, and Youngs Modulus	3
Point Load Strength Index	Every 1m of core

4.4 GROUNDWATER RISING HEAD TESTS / QUALITY TESTING

The results of the rising head testing and groundwater quality testing are included our separate Groundwater Impact Assessment report (Ref: SYDGE381816AC, dated 20 June 2025).

5. RESULTS OF INVESTIGATION

5.1 SUMMARY OF GROUND CONDITIONS

The encountered subsurface conditions were consistent with the published and anticipated geology. During the drilling of the boreholes, the following strata were present on site:

5.1.1 Fill

Fill was encountered from the surface at each borehole location. A thin layer of asphalt was present in BH01 and BH03 up to 150mm thick. Topsoil fill was encountered in the upper 100mm of BH02. Compacted gravelly sand and clayey sand fill was present to up to 1.5m depth, with a thickness ranging between 0.5m and 1.3m.

This fill profile was generally consistent across all boreholes, generally decreasing in thickness towards the northern end of the site.

5.1.2 Residual Soil

A thin layer of residual soil was encountered in BH03 from 1.5m to 2.1m depth. The residual soil is described as Sandy Clay of low to medium plasticity, pale brown and orange mottled pale grey.

5.1.3 Extremely Weathered Material

A thin layer of extremely weathered bedrock was encountered in all boreholes from 0.6m to 2.1m depth. The material generally consists of medium to coarse grained Sand and Clayey Sand, exhibiting a dense to very dense consistency.

5.1.4 Hawksbury Sandstone

Hawksbury Sandstone was encountered in all three boreholes at depths ranging from 1.6m to 2.9m. The Hawksbury Sandstone comprised typically pale grey medium to coarse grained Sandstone. The base of this unit was not proven. The sandstone has been split into three sub-units comprising Class IV, Class III / II, and Class I in accordance with the rock classification in accordance with Pells et al (1998) “Foundations on Sandstone and Shale in the Sydney region” Australian Geomechanics Journal, Dec 1998.

5.2 GEOTECHNICAL GROUND MODEL

For specific information on the encountered subsurface conditions at each borehole location, reference should be made to the attached boreholes logs in Appendix B with the accompanying Tetra Tech Coffey Soil and Rock explanation sheets, which describe the terms and symbols used in log preparation.

Using the subsurface information from the geotechnical investigation, the encountered ground conditions have been characterised into the geotechnical units presented in Table 2 below.

Table 3: Summary of site geotechnical model

Unit / Material	Description	Typical Unit Thickness (m) [1]	Typical Soil Consistency / Rock Strength
Unit 1 – Topsoil / Fill	Asphalt / Gravelly Sand / Clayey Sand, fine to medium grained	0.6 – 1.5	N/A
Unit 2A – Residual Soil (Clay)	Sandy Clay, medium to high plasticity	0.6	Stiff
Unit 2B – Residual Soil (Sand)	Sand / Clayey Sand, medium to coarse grained	0.5 – 2.3	Dense to Very Dense
Unit 3 – Sandstone Class IV	Sandstone, highly to slightly weathered	0.7 – 4.8	Low to Medium Strength
Unit 4 – Sandstone Class III/II	Sandstone, slightly weathered to fresh	3.4 – 6.7	Medium to High Strength
Unit 5 – Sandstone Class I	Sandstone, fresh	Unproven	High Strength

Notes:
[1] The unit thicknesses are based on the boreholes and may not represent the stratigraphy or the maximum or minimum depths and thicknesses of stratigraphic units across the entire site.
[2] Rock classified as Sandstone in accordance with Pells et al (1998) "Foundations on Sandstone and Shale in the Sydney region" Australian Geomechanics Journal, Dec 1998.

5.3 GROUNDWATER

On 14 May 2025 groundwater levels were measured at the three piezometers using an electronic water level dip meter. The results are provided in Table 4.

Table 4: Manually measured groundwater levels

Date	BH01 (metres below ground)	BH01 (mAHD)	BH02 (metres below ground)	BH02 (mAHD)	BH03 (metres below ground)	BH03 (mAHD)
14 May 2025	6.28	14.81	3.81	16.62	5.03	14.98

For further information on measured groundwater levels, refer to our separate Groundwater Impact Assessment report (Ref: SYDGE381816AC, dated 20 June 2025).

5.4 LABORATORY TEST RESULTS

On completion of the fieldwork, select soil and rock samples from each borehole were sent to the NATA accredited laboratory for laboratory testing. Summary of laboratory testing results are provided in Tables

Table 5 to Table 8. The laboratory test certificates are included in Appendix C.

Table 5: Moisture content and Atterberg limit testing results

Location	Details			MC (%)	Atterberg Limits and Linear Shrinkage			
	Depth (m)	Unit	Material		LL (%)	PL (%)	PI (%)	LS (%)
BH02	1.00-1.30	Res Soil	Clayey SAND	15	-	-	-	-
BH02	1.30-1.45	Ex We	Clayey SAND	9.4	-	-	-	-
BH03	1.00-1.20	Res Soil	SAND	17.8	-	-	-	-
BH03	1.50-1.95	Res Soil	Sandy Clay	17.7	41	13	28	12

Notes: 1) **MC**: Moisture Content, **LL**: Liquid Limit, **PL**: Plastic Limit, **PI**: Plasticity Index, **LS**: Linear Shrinkage. 2) No Atterberg testing was conducted on non-plastic samples.

Table 6: Particle size distribution results

Location	Details			MC (%)	Particle Size Distribution			
	Depth (m)	Unit	Material		Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH02	1.00-1.30	Res Soil	Clayey SAND	15	22	58	6	14
BH02	1.30-1.45	Ex We	Clayey SAND	9.4	0	76	11	13
BH03	1.00-1.20	Fill	Clayey SAND	17.8	8	74	8	10
BH03	1.50-1.95	Res Soil	Sandy Clay	17.7	7	54	12	27

Table 7: UCS and Young's modulus results

Location	Depth (m)	Unit	Material	UCS	Youngs Modulus, Tangent (MPa)	Youngs Modulus, Secant (MPa)
BH01	6.40-6.73	Hawksbury Sandstone	Sandstone	19	-	-
BH01	13.43-13.68			35	15,000	11,000
BH01	19.12-19.33			42	-	-
BH02	8.13-8.36			26	11,000	7,100
BH02	15.0-15.26			26	-	-
BH02	20.14-20.42			22	-	-
BH03	10.46-10.75			28	-	-
BH03	17.16-17.36			41	19,000	13,000
BH03	22.6-22.84			34	-	-

The soil aggressivity test results are provided in Table 8 and compared with the exposure classifications defined in Australian Standard AS2159-2009 Piling – 'Design and Installation'. The chemical test results indicated "***Non-aggressive***" to "***Mild-aggressive***" ground conditions to buried concrete element and "***Non-aggressive***" ground conditions to buried steel elements.

Salinity is not considered to be an issue at the site, and a salinity management plan is not considered to be required based on the following:

- The site soils extend to 2.3 m depth only inclusive of 1.5 m fill overlying residual soils and bedrock which is all above the observed groundwater level.
- The development will not be causing changes to evaporation or water flow within the shallow soil layers.
- EC values recorded for soils from boreholes only range between 14 and 270 µS/cm (refer to Table 8).

Table 8: Soil Aggressivity suite results

Location	Details		Soil Aggressivity				Corrosion Classification	
	Depth (m)	Material	pH	Sulphate as SO_4 (mg/kg)	EC (µS/cm)	Chloride (mg/kg)	Exposure: Concrete Piles	Exposure: Steel Piles
BH01	0.30-0.50	Gravelly SAND	5.3	260	270	160	Mild-aggressive	Non-Aggressive
BH02	1.00-1.30	Clayey SAND	6.1	<10	31	<10	Mild-aggressive	Non-Aggressive
BH02	1.30-1.45	Clayey SAND	6.3	<10	14	<10	Mild-aggressive	Non-Aggressive
BH03	1.00-1.20	SAND	6.9	<10	68	<10	Mild-aggressive	Non-Aggressive
BH03	1.50-1.95	Sandy Clay	7.2	10	22	<10	Non-Aggressive	Non-Aggressive

6. DISCUSSION AND RECOMMENDATIONS

6.1 GEOTECHNICAL DESIGN PARAMETERS

Table 9 presents the recommended geotechnical design parameters for each geological units which were interpreted based on the completed boreholes, geotechnical information and our experience in similar soil/rock types and ground conditions.

Table 9: Recommended geotechnical design parameters

Geological Unit [1]	Unit weight (kN/m^3)	Undrained shear strength s_u (kPa)	Effective cohesion c' (kPa)	Effective friction angle (°)	Elastic modulus E' (MPa)	K_o [2]
Unit 1 – Fill (Gravelly Sand / Clayey Sand)	19	-	0	32	35	0.5
Unit 2A – Residual Soil (Sandy Clay, St)	21	50	5	25	20 - 30	1.0
Unit 2B – Extremely Weathered Material (Sand / Clayey Sand, D-VD)	21	-	5	36	100	1.0
Unit 3 – Class IV Sandstone (L-M)	23	-	100	38	500	3.0
Unit 4 – Class III/II Sandstone (M-H)	24	-	250	45	1200	3.0
Unit 5 – Class I Sandstone (H)	24	-	1150	55	2000	3.0

Note:

[1] Rock classified using the classification system by Pells, et al. (1998).

[2] K_0 values in Table 9 assume that some retaining wall movement and relaxation of horizontal stress will occur due to the excavation. Actual K_0 values may be higher, particularly in the rock units.

6.2 EARTHWORKS

6.2.1 Site Preparation and Compaction Requirements

Where filling is required to form the foundation for floor slabs or pavements, ground should be prepared by stripping topsoil and unsuitable materials and fill material should be placed in layers not exceeding 300mm loose thickness.

Each fill layer should be proof rolled with minimum 4 passes of smooth single-drum, non-vibratory roller of minimum weight 12 tonnes. An experienced earthworks practitioner should observe the proof rolling to detect soft, wet or heaving zones. Where these zones are encountered the affected area should be improved by appropriate methods, such as:

- Excavation of the affected soil and replacement with Engineered Fill.
- Tyning and moisture conditioning of the in-situ material and compaction to achieve the criteria given below for Engineered Fill.

Fill supporting structures or pavements should be compacted to at least 100% Standard Maximum Dry Density (SMDD). Engineered Fill should be spread in layers not exceeding 250 mm loose thickness and moisture conditioned to Standard Optimum Moisture Content (SOMC) ±2% then compacted without delay with appropriate compaction plant.

Fill within 0.3 m depth of floor slab/pavement subgrade level should be compacted to at least 100% SMDD.

Preparation for, and construction of Engineered Fill should be carried out under Level 1 Geotechnical Inspection and Testing as defined in Section 8.2 of AS 3798 – 2007 Guidelines on earthworks for commercial and residential developments.

6.2.2 Re-use of Site-won Materials

Unit 1 (Fill – Gravelly Sand and Clayey Sand) and Unit 3 (Extremely Weathered Material – Sand, Clayey Sand, and Silty Clay) can be reused as general fill, provided it is adequately compacted.

Unit 2 (Residual Soil – Sandy Clay) typically exhibits medium to high plasticity and is therefore unsuitable for use as engineering fill. When considered for general fill, the potential for shrink/swell ground movements should be carefully assessed. Over compaction of this material should be avoided as this will increase shrink/swell movements.

Unit 4 to Unit 6 (Sandstone) should meet the material criteria for most backfill materials in accordance with RMS Specifications R44 and B30, except for drainage and rockfill materials, where a maximum 35% of wet/dry strength variation criteria is required. Moist sandstone would be unlikely to meet this wet/dry strength variation criteria. Addition wet/dry testing and material grading management/control are required should these units be used as drainage material or rock fill.

6.3 EXCAVATION CONDITIONS

Excavation in Units 1 and 2 should be practicable using conventional plant such as tracked excavators with a toothed bucked. For excavation in units 3 to 5, hard rock excavation techniques such as large dozers fitted with rippers, or large excavators fitted with rock saws, rock grinders, and rock hammers should be used. The use of hard rock excavation techniques will cause vibrations that could damage vibration sensitive structures, infrastructure, and underground services. Assessments of the potential impacts of excavation induced vibrations should be considered as part of the detailed design and excavation planning.

6.4 UNSUPPORTED EXCAVATIONS

The excavation for the proposed basement will be in close proximity to existing multi-level buildings, major highways and underground services.

The following batter designs are recommended for unsupported exposed cuts and fills that are above the water table and are less than 3m in height. Temporary batters should not be in place for longer than three months. Table 10 below indicates the suggested long term and temporary batter design for each geotechnical unit.

Table 10: Material units and batter designs

Unit	Material	Temporary Batter	Long Term Batter
1	Fill	1(H):1(V)	1.5(H):1(V)
2A/2B	Residual Soil [1]	1.5(H):1(V)	2(H):1(V)
3	Sandstone Class IV	1(H):1(V)	1.5(H):1(V)
4,5,	Class III to Class I Sandstone [2]	Vertical [2]	Vertical [2]

Notes:
1. *Protection against erosion may be required.*
2. *Require geotechnical inspection during excavation to assess adverse joints and wedge failure mode of rock blocks. Localised or pattern rock bolting will be required to stabilise rock wedges or blocks formed by unfavourably oriented defects. Significant weaker bands in the shale may require shotcrete protection against degradation.*

These recommended maximum batters are based on there being no structures or surcharge located at, or near the crest of the cuts. Steeper slopes in the fill, soil and weathered rock materials would require engineering designed retaining structures. Site specific advice is required for unsupported cuts greater than 3m in height.

Experienced geologist should inspect the excavated faces during and at the completion of construction to assess the need for localised doweling or rock bolting to control adversely oriented defects or to identify localised layers or zones of weaker rock that may require shotcrete protection. Where such areas are identified, permanent support could comprise 24 mm (min) diameter pre-tensioned, post-grouted rock bolts with double corrosion protection or glass-fibre reinforced plastic bolts. Rock bolt lengths will depend on actual site conditions and all rock bolts are to be installed in accordance with the manufacturer's recommendations.

6.5 RETENTION SYSTEMS

6.5.1 Retaining Wall Design

Where there is insufficient room to form temporary batters or adjacent to sensitive structures, soils and weathered sandstone (Units 1 to 3) could be supported using shoring walls such as conventional solider pile wall. Excavations in Units 4 and 5 would require rock bolting and shotcrete subject to geotechnical stage inspection and observation during excavation.

Other alternatives include top-down construction, internal propping, or temporary anchors. Temporary anchor installation would require the permission of adjacent property owners, where anchors cross boundaries or easements.

It is recommended that a detailed analysis be undertaken, including assessment of surcharge loads, to develop a suitable retention support system. As a guide,

Table 11 presents recommended design parameters for the design of retaining wall. Retaining wall analyses will need to consider surcharges, footing loads from adjacent structures and hydrostatic pressure.

Table 11: Recommended retaining wall design parameters

Unit	Material	Bulk unit Weight γ (kN/m^3)	'Active' Earth Pressure Coefficient, K_a	'Passive' Earth Pressure Coefficient, K_p	'At Rest' Earth Pressure Coefficient, K_0	Ultimate Lateral Bearing Capacity (MPa)
1	Fill (Gravelly Sand / Clayey Sand)	18	0.31	3.25	0.5	-
2A	Residual Soil (Sandy Clay, St)	21	0.41	2.46	1.0	-
2B	Extremely Weathered Material (Sand / Clayey Sand, D-VD)	21	0.26	3.85	1.0	-
3	Class IV Sandstone (L-M)	23	0.24	4.20	1.0	2
4	Class III/II Sandstone (M-H)	24	-	-	3.0	9
5	Class I Sandstone (H)	24	-	-	3.0	12

Temporary ground anchors shall be embedded in the sandstone bedrock (Units 4 and 5) and be pre-stressed to minimise lateral wall movement during excavation. Temporary ground anchors design and construction must consider interaction with the adjacent structures, public roads, facility and existing utilities.

Active earth pressure coefficients should be adopted where wall movements of about 1% of the wall height can be tolerated. At rest pressure coefficients should be adopted where less movement can be tolerated. However, it should be understood that a well-constructed wall will still undergo movements of the order of 0.1% to 0.3% of the wall height where at rest pressures are adopted. We can aid in detailed analysis of retaining wall movements should this be required.

Retaining walls should be designed for hydrostatic pressures unless permanent and effective drainage can be provided. Applicable surcharge loads should be added to earth pressures.

6.5.2 Rock Anchors

Temporary anchors should be inclined downwards to anchor in the better-quality sandstone. Design of anchors may be based on an average ultimate bond stress values for the rock-grout bond length of not greater than 5m bond length as in Table 12 below. It should be noted that the rock-grout bond strengths provided in this section are for rock anchors with the rock grout bonded diameter of less than approximately 250mm. Rock-grout bond strength (or shaft friction) for piles with diameter well exceed 250mm are provided in the previous section for foundation design.

Table 12: Recommended typical rock-grout bond strength for grouted anchor

Geological Unit [(1)]	Allowable Rock-grout Bond Strength [(2)] (kPa)	Ultimate Rock-grout Bond Strength [(2)] (kPa)
Unit 4 – Class III/II Sandstone	400	1250
Unit 5 – Class I Sandstone	800	2500

Notes:

[(1)] Rock classified using the classification system by Pells, et al. (1998).

[(2)] Rock grout bond strength is applicable to ground anchor diameter less than 250m with bond length of up to 5m.

The actual design load capacity of anchors should be based on a performance specification, verified by proof-testing. This is particular important when anchors are constructed within the highly weathered material, where the actual ground condition encountered by the anchor may be variable.

6.6 BUILDING FOUNDATIONS

Table 13 presents the recommended serviceability and limit state geotechnical design parameters that may be used for design of footings founded in the encountered geological units within the site. Approximate Young's modulus and corresponding modulus of subgrade reaction are provided for foundation settlement and differential settlement analyses under foundation loads.

Table 13: Recommended foundation design parameters

Unit	Soil/Rock Classification	Serviceability End Bearing Pressure (MPa)	Ultimate End Bearing Capacity (MPa)	Allowable Shaft Adhesion (kPa) [4]	Ultimate Shaft Adhesion (kPa) [4]	Modulus of Subgrade Reaction (MN/m^3)	Young's Modulus (MPa)
2A	Residual Soil (St)	0.1	0.25	15	40	10 - 15	20 - 30
2B	Residual Soil (D-VD)	0.5	2	40	80	20 - 40	100
3	Class IV Sandstone (L-M)	1 [2]	6 [3]	150 [1]	300 [1]	160	500
4	Class III/II Sandstone (M-H)	6 [3]	50 [3]	600 [1]	1500 [1]	900	1200
5	Class I Sandstone (H)	10 [3]	100 [3]	1200 [1]	3000 [1]	1800	2000

Notes:
[1] For piles, shaft adhesion should only be assumed where piles have a minimum socket of at least 1 pile diameter and a clean socket of roughness category R2 or better is required. Values may have to be reduced if wall smear or polish is present.
[2] Assumes that at least 40% of footings are proved by core drilling or spoon testing.
[3] Assumes that the ground condition for each footing is proved by core drilling or spoon testing.
[4] Shaft adhesion values are for pile in compression. In tension load, the provided shaft adhesion should be reduced by applying a factor of 0.7 in addition to the strength reduction factor.

For pad footings either a working stress or limit state design method could be adopted. For piles a limit state design method should be used if the design is to comply with AS2 159-2009 "Piling – Design and installation".

Footings designed using the serviceability end bearing pressures given above should result in settlements of less than 1% of the least footing dimension. Coffey can provide detailed analysis and refinement of the foundation system to support detailed design if required.

In accordance with AS2159-2009, the geotechnical strength reduction factor, Φg, is dependent on assignment of an Average Risk Rating (ARR) which takes into account various geotechnical uncertainties, redundancy of the foundation system, construction supervision, and the quantity and type of pile testing. The assessment of Φg therefore depends on the structural design of the foundation system as well as the design and construction method, and testing (if any) to be employed by the designer and piling contractor.

To assist you with preliminary design we recommend Φg of 0.5 be adopted for footings on bedrock. The final selection of Φg should be reviewed by us at the detailed design stage.

If foundations are to resist uplift, the ultimate shaft adhesion should be reduced by applying a factor of 0.7 in addition to the strength reduction factor. Uplift piles should also be checked for an inverted cone pullout mechanism.

6.7 INTERACTION WITH ADJACENT INFRASTRUCTURE

The proposed clinical tower development is located directly adjacent to multi-level apartment buildings, underground assets, and the existing St George Private Hospital.

For the protection of adjoining structures, the type of structure, location, layout, and depth should be determined at the commencement of excavation design works. This information could then be used in conjunction with available information on site ground conditions and the results of any subsequent investigations for geotechnical assessments to determine whether the excavations may affect existing structures. Depending on the complexity of the geotechnical problem, analytical methods would range from a simple empirical assessment, through to 3-dimensional finite element analyses and consultation with the project structural engineers will be required to assess possible load influences, resulting ground movements/stresses, and additional support requirements.

The use of excavation plant such as impact hammers will generate vibrations that may affect any surrounding sensitive structures and buried services. Measures to mitigate the risks associated with vibration such as the use of rock saws or rock grinders should be considered. The vibration limits in Table 14 below are commonly recommended to reduce the risk of vibration damage to sensitive receptors.

Table 14: Ground Vibration Limits for Various Types of Structures

Type of Structure	Peak Particle Velocity (mm/s)
Historic buildings or monuments	2
Residential or low-rise buildings in good condition	10
Reinforced concrete commercial and industrial buildings in good condition	25
Sydney water Assets (Brittle Pipe assets – RC, VC/EW, CICL)	10
Sydney water Assets (Ductile Pipe assets – SCL, DI, PVC, PE, PP, GRP)	20

It is recommended that a limit is selected considering the structure of concern. It should be noted that limits set by the relevant authorities may override these recommendations.

Dilapidation surveys should be carried out on neighbouring structures or sensitive services prior to commencing excavation as a baseline record of their condition. Excavation trials with vibration monitoring should also be carried out to assess appropriate distances for various excavation plant to be used to limit generated vibrations and need for ongoing vibration monitoring during site works to confirm that the limits are not exceeded.

6.8 LANDSLIDE RISK

According to eSPADE website published by the NSW Department of Planning, Industry and Environment, the site is not within a known registered landslide risk area, or within an NSW Mine Subsidence District.

Generally, deep seated land sliding in Hawkesbury Sandstone is rare and instability generally occurs as rock topples.

6.9 SOIL AGGRESSIVITY

The aggressivity test results indicate low sulphate and chloride levels and low resistivity. The results of aggressivity testing have been compared to the guidelines for concrete and steel piles in AS2159-2009. Based on sulphate levels, chloride levels, pH, and resistivity, the tested fill and residual soil is mild-aggressive to non-aggressive towards concrete and non-aggressive towards steel. Details of the test results, together with the laboratory's assessment are presented in Appendix C.

6.10 GROUNDWATER CONTROL / DEWATERING

Groundwater seepages in this geological setting typically occur at soil/rock interfaces, through joint swarms and in bedrock joints and partings. Bedrock seepage in sandstone bedrock could be assumed as typically flowing toward local drainage lines or the regional water table, along horizontal bedding planes and sub-vertical joints. Sandstone is not typically a highly permeable material; therefore, the rock mass permeability will be governed by joints, bedding planes, and other defects within the rock mass.

Groundwater levels recorded to date suggest basement excavation could encounter groundwater inflow. In this geology groundwater inflows into the basement can generally be controlled using conventional sump and pump techniques for discharge into stormwater or sewer systems networks, subject to regulatory approvals. For a drained basement, permanent floor and wall drainage will need to be maintained to dispose of groundwater inflows throughout the life of the structure. It is expected that such a drainage system would include a sub-floor drainage blanket with slotted drainage pipes and a sump and pump system with the ability to effectively back flush the system for long-term maintenance. For further information, refer to Tetra Tech Coffey Groundwater Impact Assessment for the project (ref: SYDGE381816AB).

6.11 RECOMMENDED FURTHER INVESTIGATION

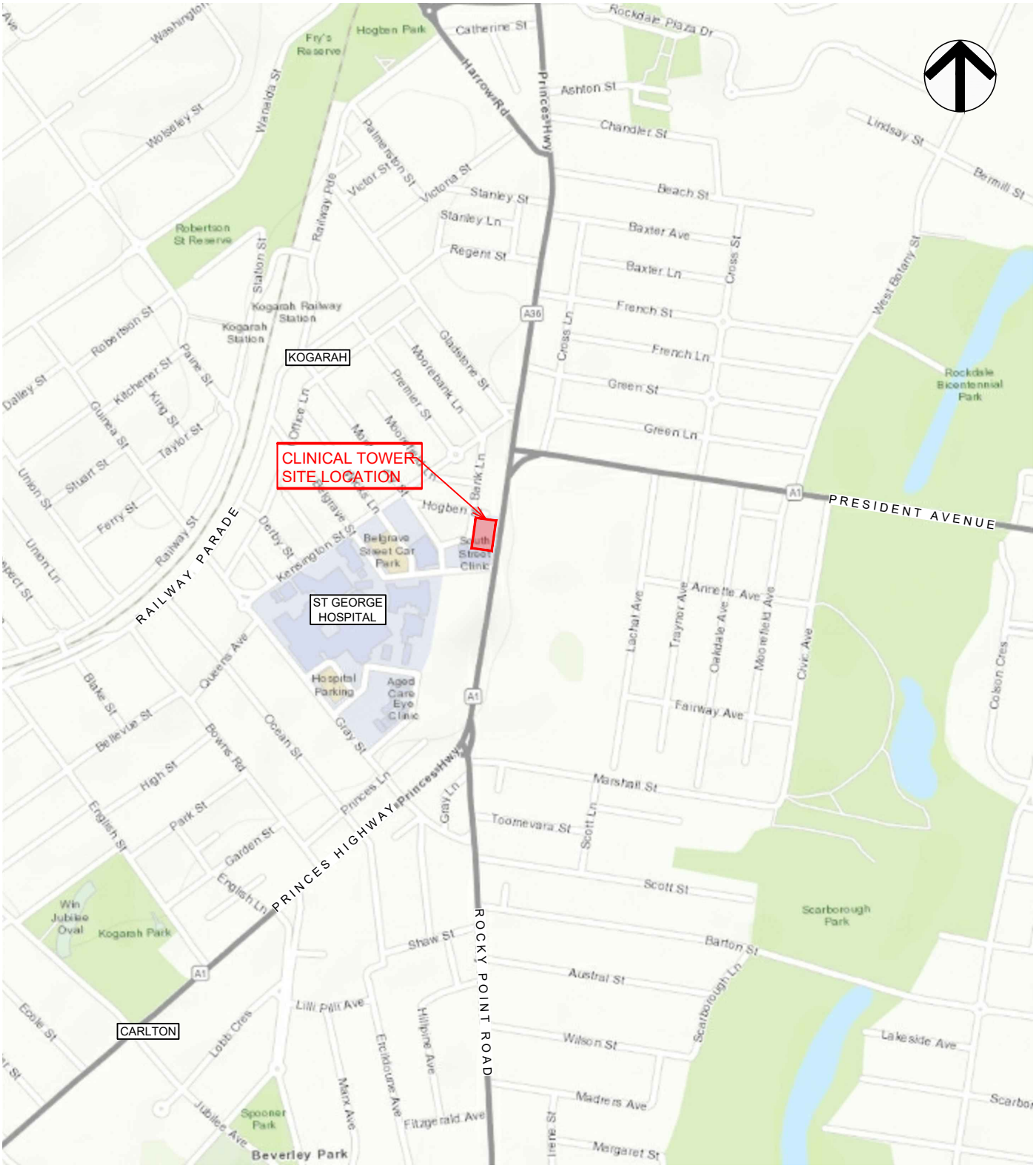
Detailed geotechnical investigations involving the drilling of cored boreholes will be required to support building detailed design works. We expect that such an investigation would comprise the drilling of additional boreholes (i.e., 3 to 4 boreholes) into the bedrock below proposed foundation locations/levels. The aim of the investigation would be to assess the bedrock quality for foundation design. Following finalisation of the footing layout and design, in consultation with the project structural designers, further foundation proving boreholes at selected footing locations may also be necessary.

To support detailed basement and foundation design, we propose to drill a number of additional deep boreholes to depths approximately 5 m below design basement level. Such an investigation would collect information on bedrock strength and defects across the site to assist optimisation of building footing and excavation design/planning.

7. CLOSURE

Subsurface conditions can be complex and may vary over relatively short distances and over time. The inferred geotechnical model and recommendations in this report are based on limited subsurface investigations at discrete locations. The engineering logs describe subsurface conditions only at the investigation locations. Further investigations may be required to support detailed design if there are scope limitations or changes to the nature of the project. We can assist with detailed design and/or to review designs and verify that the conditions exposed are consistent with design assumptions during construction. The attached document entitled “Important information about your Tetra Tech Coffey report” forms an integral part of this report and presents additional information about its uses and limitations.

APPENDIX A: BOREHOLE LOCATION PLAN



MAP PROJECTION: GDA2020 MGA ZONE 56

100 0 100 300 500

Scale (metres) 1:10000

IMAGERY SOURCE: WORLD TOPOGRAPHIC MAP
SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

drawn	EP / DR
approved	-
date	15-05-2025
scale	AS SHOWN
original size	A4

TETRA TECH COFFEY

client: AKALAN PROJECTS PTY LTD

project: ST GEORGE PRIVATE HOSPITAL
HOGBEN STREET, KOGARAH, NSW

title: SITE LOCATION PLAN

project no: 754-SYDGE381816 | figure no: FIGURE 1 | rev: A

PLOT DATE: 15/5/2025 10:40:06 AM DWG FILE: F:\1. PROJECTS\4. SYD-GEOTECHNICS\22. SYDGE380000\SYDGE381816 - ST GEORGE HOSPITAL (RHC)\12. CAD\754-SYDGE381816.DWG

revision	no.	description	drawn	approved	date

LEGEND

- SITE BOUNDARY
- BOREHOLE LOCATION

MAP PROJECTION: GDA2020 MGA ZONE 56

5 0 5 10 15

Scale (metres) 1:300

drawn	EP / DR
approved	-
date	27-06-2025
scale	AS SHOWN
original size	A3

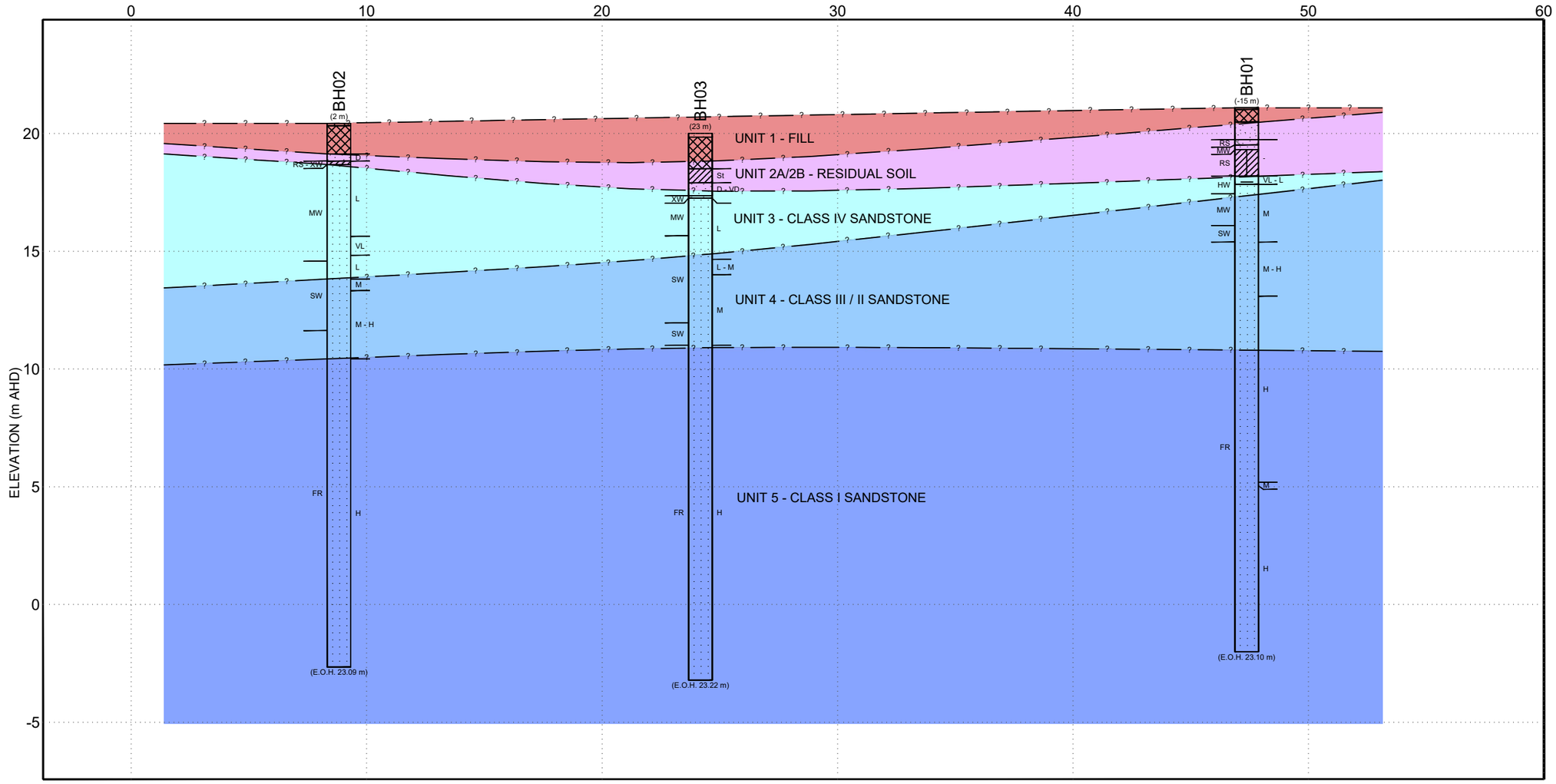
TETRA TECH COFFEY

client: AKALAN PROJECTS PTY LTD

project: ST GEORGE PRIVATE HOSPITAL
HOGBEN STREET, KOGARAH, NSW

title: SITE LAYOUT

project no: 754-SYDGE381816 | figure no: FIGURE 2 | rev: A



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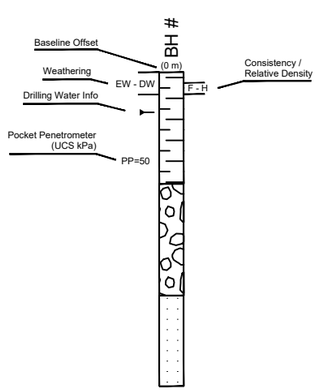
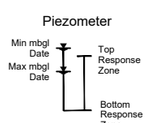


Piezometer



MATERIAL GRAPHIC

- CONCRETE
- FILL
- SAND
- SANDSTONE
- SILTY CLAY
- SILTSTONE
- SANDY CLAY
- CLAYEY SAND
- TOPSOIL

PROJECT UNIT

- UNIT 1 - FILL
- UNIT 2A/2B - RESIDUAL SOIL
- UNIT 3 - CLASS IV SANDSTONE
- UNIT 4 - CLASS III / II SANDSTONE
- UNIT 5 - CLASS I SANDSTONE

H 1:200

2.5 0 2.5 5 7.5 10

V 1:200

2.5 0 2.5 5 7.5 10

Coord.System: GDA2020 Height Datum: AHD

drawn	EP
approved	VN
date	27-06-2025
scale	AS SHOWN
original size	A3

TETRA TECH COFFEY

client: AKALAN PROJECT PTY LTD

project: ST GEORGE PRIVATE HOSPITAL
REFER TO SITE PLAN

title: SUBSURFACE SECTION

project no: 754-SYDGE381816AA | figure no: FIGURE 1 | rev: A

APPENDIX B: ENGINEERING BOREHOLE LOGS

ROCK DESCRIPTION EXPLANATION SHEET

The descriptive terms used by Tetra Tech Coffey are given below. They are broadly consistent with Australian Standard AS1726:2017.

DEFINITIONS: Rock material, defect, structure and rock mass are defined as follows:

Rock material	In engineering terms rock material is any naturally occurring aggregate of minerals and/or organic materials that cannot be disaggregated by hand in air or water without prior soaking. Rock material is intact rock that is bounded by defects. Material which can be disaggregated or remoulded should be described as a soil.
Defect	Discontinuity, fracture, break or void in the material or materials across which there is little or no tensile strength.
Structure	Nature and configuration of the different defects within the rock mass and their relationship with each other.
Rock mass	It is the entirety of the system formed by all of the rock material and all of the defects. That is, it is a body of material which is not effectively homogeneous.

MATERIAL DESCRIPTIVE TERMS:

Rock name	Simple rock names are used rather than precise geological classification.
Particle size	Grain size terms for sandstone are:
Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mm to 0.6mm
Fine grained	Mainly 0.06mm (just visible) to 0.2mm
Fabric	When grains show an alignment, a preferred orientation or a layering (e.g. bedding or lamination for sedimentary rocks, and foliation or cleavage for metamorphic rocks) the terms used are:
Massive	No layering or penetrative fabric.
Indistinct	Layering or fabric just visible. Little effect on strength properties.
Distinct	Layering or fabric is easily visible. Rock may break more easily parallel to the fabric.

CLASSIFICATION OF MATERIAL WEATHERING

Term	Abbreviation	Definition
Residual Soil	**RS**	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. Soil has not been significantly transported.
Extremely Weathered	**XW**	Material is weathered to such an extent that it has soil properties, i.e. it either disaggregates or can be remoulded in water. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered[1]	**HW**	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 recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching or may be decreased due to the deposition of weathering products in pores.
Moderately Weathered[1]	**MW**	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 no longer recognisable. Little or no change of strength from fresh rock.
Slightly Weathered	**SW**	Rock is partially discoloured with staining or bleaching adjacent to defects, but shows little or no change of strength from fresh rock.
Fresh	**FR**	Rock shows no sign of decomposition of individual minerals or colour changes.

Notes on Weathering:

1. The term 'Distinctly Weathered' (DW) may be used where it is not practicable (or it is judged that there is no advantage in making such a distinction) to distinguish between 'Highly Weathered' and 'Moderately Weathered'. 'Distinctly Weathered' is defined as follows: 'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'.
2. Where physical and chemical changes of the rock material are caused by hot gases or liquids at depth (process called alteration) the term 'altered' may be substituted for 'weathering' to give the abbreviations XA, HA, MA, SA and DA.

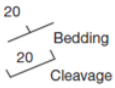
ROCK MATERIAL STRENGTH TERMS

Term (Abbreviation)	Guide to Strength: Point Load Strength Index, $I_{s(50)}$ (MPa)	Guide to Strength: Field Assessment
Very Low (VL)	0.03 - 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; too hard to cut a triaxial sample by hand; pieces up to 30mm thick can be broken by finger pressure.
Low (L)	0.1 - 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm bows of a pick point; has a dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium (M)	0.3 to 1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High (H)	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High (VH)	3 to 10	Hand specimen breaks after more than one blow; rock rings under hammer.
Extremely High (EH)	More than 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Notes on Rock Material Strength:

1. Material with strength less than 'Very Low' should be described using soil characteristics.
2. The method of measuring the $I_{s(50)}$ should be in accordance with AS 4133.4.2.
3. The rock strength should be determined perpendicular to any anisotropy in the rock. High strength anisotropic rocks may readily break parallel to the planar anisotropy.
4. Although AS1726:2017 provides a basis for rock strength terms based on Unconfined Compressive Strength (UCS), the ratio between UCS and $I_{s(50)}$ may vary from less than 10 to over 30 depending on the rock type and overall strength. The UCS/$I_{s(50)}$ strength ratio should be determined for each rock material.
5. The rock strength classification using $I_{s(50)}$ above should be considered indicative only. The rock strength classified in accordance with AS1726:2017 may be higher or lower if UCS results are available.

COMMON ROCK DEFECT TYPES

Term	Definition	Diagram	Map Symbol	Graphic Log (Note 1)
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub-parallel to layering (e.g. bedding) or a planar anisotropy in the rock material (e.g. cleavage). May be open or closed.			
Joint	A surface or crack with no apparent shear displacement and across which the rock has little or no tensile strength, but which is not parallel or sub-parallel to layering or to planar anisotropy in the rock material. May be open or closed.			
Sheared Zone/Seam (Note 3)	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.			
Sheared Surface (Note 3)	A near planar, curved or undulating surface which is usually smooth, polished or slickensided and which shows evidence of shear displacement.			
Crushed Seam (Note 3)	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.			
Infilled 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 up to 1mm thick may be described as veneer or coating on a joint surface.			
Extremely Weathered Seam	Seam of soil material, often with gradational boundaries. Formed by weathering of the rock material in place.			

Notes on Defects:

1. Usually borehole logs show the true dip of defects, and face sketches and sections show the apparent dip.
2. Partings and joints are not usually shown on the graphic log unless considered significant.
3. Sheared zones/seams, sheared surfaces and crushed seams are generally faults in geological terms.

DEFECT SHAPE TERMS

Planar	The defect does not vary in orientation
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps
Irregular	The defect has many sharp changes of orientation

Note: The assessment of defect shape is partly influenced by the scale of the observation.

DEFECT ROUGHNESS TERMS

Very Rough	Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper.
Rough	Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper.
Smooth	Smooth to touch. Few or no surface irregularities.
Polished	Shiny smooth surface.
Slickensided	Grooved or striated surface, usually polished.

DEFECT COATING TERMS

Clean	No visible coating.
Stained	No visible coating but surfaces are discoloured.
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy.
Coating	A visible coating up to 1mm thick. Thicker soil material should be described using appropriate defect terms (e g. infilled seam). Thicker rock strength material should be described as a vein.

DIMENSION OF DEFECTS

Spacing, length, openness and thickness

The spacing, length, aperture (openness), and seam thickness should generally be described directly in millimetres or metres.

Block Shape

Where it is considered significant, block shape (e.g. tabular, prismatic, columnar) should be described using the terms in Table 23 of AS 1726:2017.

SOIL DESCRIPTION EXPLANATION SHEET

DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disaggregated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

CLASSIFICATION SYMBOL & SOIL NAME

Soils are described in accordance with AS 1726:2017 as shown in the table on Sheet 2.

PARTICLE SIZE DEFINITIONS

Components	Subdivision	Size (mm)
Boulders Cobbles		>200 63 - 200
Gravel	Coarse Medium Fine	19 - 63 6.7 - 19 2.36 - 6.7
Sand	Coarse Medium Fine	0.6 - 2.36 0.210 - 0.6 0.075 - 0.21
Silt Clay		0.002 – 0.075 < 0.002

MOISTURE CONDITION

Coarse Grained Soil

Dry (D)	Non-cohesive and free-running
Moist (M)	Soil feels cool, darked in colour. Soil tends to stick together.
Wet (W)	As for moist, with free water forming when handled.

Fine Grained Soil

Moist, dry of plastic limit ($w<W_P$)	Hard and friable or powdery
Moist, near plastic limit ($w\approx W_P$)	Can be moulded at a moisture content approximately equal to the plastic limit.
Moist, wet of plastic limit ($w>W_P$)	Soils usually weakened and free water forms on hands when handling.
Wet, near liquid limit ($w\approx W_L$)	Near liquid limit.
Wet, wet of liquid limit ($w>W_L$)	Wet of liquid limit.

CONSISTENCY OF COHESIVE SOILS

Term (Abbreviation)	Indicative undrained shear strength s_u (kPa)	Field guide
Very Soft (VS)	<12	Soil exudes between fingers when squeezed in hand.
Soft (S)	12 – 25	Soil can be moulded by light finger pressure.
Firm (F)	25 – 50	Soil can be moulded by strong finger pressure.
Stiff (St)	50 – 100	Soil cannot be moulded by fingers.
Very Stiff (VSt)	100 – 200	Soil can be indented by thumb nail.
Hard (H)	>200	Soil can be indented with difficulty by thumb nail.
Friable (Fb)	–	Soil can be easily crumbled or broken into small pieces by hand.

RELATIVE DENSITY OF NON-COHESIVE SOILS

Term (Abbreviation)	Density index (%)
Very Loose (VL)	Less than 15
Loose (L)	15 – 35
Medium Dense (MD)	35 – 65
Dense (D)	65 – 85
Very Dense (VD)	Greater than 85

MINOR COMPONENTS

Term	Assessment Guide	Proportion of minor component in:
Trace	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: Fines - <5%, Accessory coarse fraction - <15% Fine grained soils: sand/gravel <15%
With	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: Fines - 5 to 12%, Accessory coarse fraction – 15 to 30% Fine grained soils: sand/gravel 15 to 30%

SOIL STRUCTURE AND CEMENTATION

Zoning		Cementation	
Layer	Zone is continuous across exposure or sample.	Weakly cemented	Easily disaggregated by hand in air or water.
Lense	Discontinuous layer of different material, with lenticular shape.	Moderately cemented	Effort is required to disaggregate the soil by hand in air or water.
Pocket	Irregular inclusion of different material.		

GEOLOGICAL ORIGIN

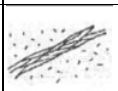
Residual soil	Structure and fabric of parent rock not visible.
Extremely weathered material	Structure and/or fabric of parent rock is visible.
Alluvial soil	Deposited by streams and rivers.
Estuarine soil	Deposited in coastal estuaries, including sediments carried by inflowing rivers and streams, or tidal currents.
Marine soil	Deposited in a marine environment
Lacustrine soil	Deposited in freshwater lakes
Aeolian soil	Carried and deposited by wind
Colluvial soil	Deposited on slopes (transported downslope by gravity, with or without assistance of water).
Topsoil	Mantle of surface or near surface material, often defined by high levels of organic material.
Fill	Any material which has been placed by anthropogenic processes. Fill may be significantly more variable between tested locations than naturally occurring soils.

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 63 mm and basing fractions on estimated mass)							GROUP SYMBOL	SOIL NAME
COARSE GRAINED SOIL More than 65% of materials less than 63 mm is larger than 0.075 mm	(A 0.075 mm particle is about the smallest particle visible to the naked eye)	GRAVEL More than half of coarse fraction is larger than 2.36 mm	CLEAN GRAVEL (Fines less than 5%)	Wide range in grain size and substantial amounts of all intermediate particle sizes, not enough fines to bind coarse grains, no dry strength.			GW	GRAVEL
				Predominantly one size or a range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength.			GP	GRAVEL
			GRAVEL with FINES (Fines greater than 12%)	'Dirty' materials with excess of non-plastic fines (for identification procedures see ML below).			GM	Silty GRAVEL
				'Dirty' materials with excess of plastic fines (for identification procedures see CL below).			GC	Clayey GRAVEL
		SAND More than half of coarse fraction is smaller than 2.36	CLEAN SAND (Fines less than 5%)	Wide range in grain sizes and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength.			SW	SAND
				Predominantly one size or a range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength.			SP	SAND
			SAND with FINES (Fines greater than 12%)	'Dirty' materials with excess of non-plastic fines (for identification procedures see ML below).			SM	Silty SAND
				'Dirty' materials with excess of plastic fines (for identification procedures see CL below).			SC	Clayey SAND
FINE GRAINED SOIL More than 35% of material less than 63 mm is smaller than 0.075 mm			IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm					
		SILT & CLAY Liquid limit less	DRY STRENGTH	DILATANCY	TOUGHNESS			
			None to low	Slow to rapid	Low		ML	SILT
			Medium to high	None to slow	Medium		CL, CI	CLAY
			Low to medium	Slow	Low		OL	Organic SILT
		SILT & CLAY Liquid limit	Low to medium	None to slow	Low to medium		MH	SILT
			High to very high	None	High		CH	CLAY
			Medium to high	None to very slow	Low to medium		OH	Organic CLAY
HIGHLY ORGANIC SOILS			Readily identified by colour, odour, spongy feel and frequently by fibrous texture.				PT	Peat

● Low plasticity – Liquid Limit W_L less than 35%. ● Medium plasticity –W_L between 35% and 50%. ● High plasticity – W_L greater than 50%.

COMMON DEFECTS IN SOIL

TERM	DEFINITION	DIAGRAM
Parting	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (e g. bedding). May be open or closed.	
Fissure	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. May include desiccation cracks.	
Sheared Seam	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks.	
Sheared Surface	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect	

TERM	DEFINITION	DIAGRAM
Softened Zone	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere	
Tube	Tubular cavity. May occur singly or as one of a large number of separate or interconnected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter. Origins include root holes, animal burrows, tunnel erosion.	
Tube cast	An infilled tube. The infill may be uncemented or weakly cemented soil or have rock properties.	
Infilled Seam	Sheet or wall like body of soil substance or mass with roughly planar to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open defects.	

TETRA TECH COFFEY

Engineering Log - Borehole

Borehole ID.	***BH01***
sheet:	1 of 4
project no.	***754-SYDGE381816***
client:	***Akalan Project Pty Ltd***
date started:	***30 Apr 2025***
principal:	
date completed:	***30 Apr 2025***
project:	***St George Private Hospital***
logged by:	***RZ/EO***
location:	***Refer to Site Plan***
checked by:	***IG***

position: E: 327,832.40; N: 6,240,107.90 (GDA2020) | surface elevation: 21.09 m (AHD) | angle from horizontal: 90°

drill model: D-4T, Truck mounted | drilling fluid: Water | hole diameter : 52/120

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	soil origin, structure and additional observations
HA, C, AD/V		Not Observed	D	21				**ASPHALT CONCRETE**.	D			**FILL**
								FILL: Gravelly SAND: fine to medium grained, brown-grey mottled red and pale grey, fine to medium grained, sub-angular to angular gravel, trace glass fragments.				
				20	1.0		SP	**SAND**: fine to medium grained, brown to pale brown-grey. 1.0 m: becoming pale grey 1.2 m: becoming orange brown				**EXTREMELY WEATHERED MATERIAL** No SPT conducted due to shallow bedrock
								Borehole BH01 continued as cored hole				
				19	2.0							
				18	3.0							
				17	4.0							
				16	5.0							
				15	6.0							
				14	7.0							

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method
DT diatube
AD auger drilling*
AS auger screwing*
HA hand auger
W washbore
RR rock roller

* bit shown by suffix
e.g. AD/T
B blank bit
T TC bit
V V bit

support
M mud
C casing
N nil

penetration
1 2 3 no resistance ranging to refusal

water
10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests
B bulk disturbed sample
D disturbed sample
E environmental sample
SS split spoon sample
U## undisturbed sample ##mm diameter
HP hand penetrometer (kPa)
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
VS vane shear; peak/remouded (kPa)
R refusal
HB hammer bouncing

soil group symbol & material description
based on AS 1726:2017

moisture condition
D dry
M moist
W wet
Wp plastic limit
Wl liquid limit

consistency / relative density
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

TETRA TECH COFFEY

Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	2 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**30 Apr 2025**
principal:	
date completed:	**30 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,832.40; N: 6,240,107.90 (GDA2020) | surface elevation: 21.09 m (AHD) | angle from horizontal: 90°

drill model: D-4T, Truck mounted | drilling fluid: Water | hole diameter : 52/120

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	material description (ROCK TYPE: grain characterisics, colour, structure, minor components)	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral)	samples, field tests & Is(50) (MPa) (a = axial; d = diametral)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		21								
		20	1.0	started coring at 1.36m						
NMLC	Not Observed	19	2.0	**CLAYEY SAND**: fine to medium grained, pale grey mottled orange-brown and red.	RS					PT, 5°, PL, RO, Fe SN - Clay VN
				SANDSTONE: medium to coarse grained, red-brown and pale grey.	MW					PT, 5 - 10°, UN, RO, CN
					RS					PT, 5°, PL, RO, Fe SN
				Silty CLAY: high plasticity, pale grey mottled dark grey, with bands of siltstone up to 50 mm.				0%		
				2.30 to 2.40 m: becoming pale grey mottled dark grey and red						
		18	3.0	**SILTSTONE**: dark grey, banded orange-brown, distinctly laminated at 5° to 10°.	HW					**CLASS IV HAWKESBURY SANDSTONE**
				SANDSTONE: medium to coarse grained, dark red-brown and orange-brown.						Fracture zone, 30 mm
										SM, Clay, 70 mm
										PT, 5°, PL, RO, Fe SN
										PT, 10°, PL, RO, Fe SN
										JT, 40 - 85°, ST, RO, Fe SN - Clay
										PT, 15°, PL, RO, Fe SN
										SM, Clay, 35 mm
										SM, Clay, 35 mm
										PT, 15°, PL, RO, Fe healed
		17	4.0	**SANDSTONE**: medium to coarse grained, dark red and orange-brown.	MW		d=0.42 a=0.63			**CLASS III/II HAWKESBURY SANDSTONE**
				4.49 m: singular siltstone lamina				84%		PT, 20°, PL, RO, Fe SN
										SM, Clay, 5 mm
		16	5.0	**SANDSTONE**: medium to coarse grained, pale grey, banded orange-brown grading to pale grey, indistinctly cross bedded at 5° - 10°.	SW		d=0.67 a=0.55			PT, 5°, PL, RO, Fe SN
				5.12 m: no orange-brown bands						PTx4, 5 - 10°, PL, Fe healed
					FR		d=0.87 a=1.08			SM, Clay, 5 mm
		15	6.0							
	14/05/25									PT, 10°, PL, RO, CN
		14	7.0				d=0.86 a=0.67	99%		
				7.46 to 7.50 m: with siltstone laminae						
							d=0.88			

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method
DT diatube
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
RR rock roller

support
C casing M mud N none

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SS sheared surface
SZ sheared zone
CO contact
CS crushed seam
SM seam

roughness
VR very rough
RO rough
SO smooth
POL polished
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

coating
CN clean
SN stained
VN veneer
CO coating

TETRA TECH COFFEY

Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	3 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**30 Apr 2025**
principal:	
date completed:	**30 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,832.40; N: 6,240,107.90 (GDA2020) | surface elevation: 21.09 m (AHD) | angle from horizontal: 90°

drill model: D-4T, Truck mounted | drilling fluid: Water | hole diameter : 52/120

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
NMLC	Not Observed	13			**SANDSTONE**: medium to coarse grained, pale grey, banded orange-brown grading to pale grey, indistinctly cross bedded at 5° - 10°. *(continued)*	FR		a=1.34	99%		**CLASS III/II HAWKESBURY SANDSTONE** PT, 5°, PL, RO, CN
		12	9.0		**SANDSTONE**: medium to coarse grained, pale grey, distinctly cross bedded at 5° - 15°.			d=1.45 a=2.51			PT, 5°, PL, RO, CN CS, 15 mm
		11	10.0		**SANDSTONE**: medium to coarse grained, dark grey speckled pale grey and pale brown, indistinctly cross bedded at 5° - 15°. **SANDSTONE**: medium to coarse grained, pale grey, distinctly cross bedded at 5° - 15°.			d=1.18 a=0.89	99%		SM, Clay, 10 mm PT, 5°, PL, RO, CN **CLASS I HAWKESBURY SANDSTONE**
		10	11.0					d=1.89 a=1.47			
		9	12.0					d=1.94 a=1.84			
		8	13.0					d=1.77 a=1.62	100%		
		7	14.0					d=2.09 a=1.31			
		6	15.0		14.84 m: siltstone nodule			d=0.76 a=2.05	100%		

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method
DT diatube
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
RR rock roller

support
C casing M mud N none

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SS sheared surface
SZ sheared zone
CO contact
CS crushed seam
SM seam

roughness
VR very rough
RO rough
SO smooth
POL polished
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

coating
CN clean
SN stained
VN veneer
CO coating

TETRA TECH COFFEY

Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	4 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**30 Apr 2025**
principal:	
date completed:	**30 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,832.40; N: 6,240,107.90 (GDA2020) | surface elevation: 21.09 m (AHD) | angle from horizontal: 90°

drill model: D-4T, Truck mounted | drilling fluid: Water | hole diameter : 52/120

drilling information				material substance					rock mass defects		
method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
NMLC	Not Observed	5			15.90 to 16.04 m: fine to medium sandstone band, dark grey, trace siltstone **SANDSTONE**: medium to coarse grained, pale grey, distinctly cross bedded at 5° - 15°. *(continued)*	FR		d=0.35 a=0.64			**CLASS I HAWKESBURY SANDSTONE**
		4	17.0					d=1.24 a=1.16	100%		
		3	18.0					d=2.22 a=1.57			
		2	19.0		18.64 to 18.75 m: distinctly cross bedded at 10° - 15° 19.65 to 19.80 m: turbulent bedding			d=2.60 a=1.42	100%		
		1	20.0					d=1.91 a=2.14			
		0	21.0					d=1.47 a=1.61			
		-1	22.0					d=1.74 a=1.52	100%		
		-2	23.0		Borehole BH01 terminated at 23.10 m Target depth			d=1.16 a=1.29			

method
DT diatube
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
RR rock roller

support
C casing M mud N none

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SS sheared surface
SZ sheared zone
CO contact
CS crushed seam
SM seam

roughness
VR very rough
RO rough
SO smooth
POL polished
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

coating
CN clean
SN stained
VN veneer
CO coating

TETRA TECH COFFEY

Piezometer Installation Log

Hole ID.	***BH01***
sheet:	1 of 1
project no.	***754-SYDGE381816***
client:	***Akalan Project Pty Ltd***
date started:	***30 Apr 2025***
principal:	
date completed:	***30 Apr 2025***
project:	***St George Private Hospital***
logged by:	***RZ/EO***
location:	***Refer to Site Plan***
checked by:	***IG***

position: E: 327,832.40; N: 6,240,107.90 (GDA2020) | surface elevation: 21.09 m (AHD) | angle from horizontal: 90°

equipment type: D-4T, Truck mounted | drilling fluid: Water | hole diameter : 52/120

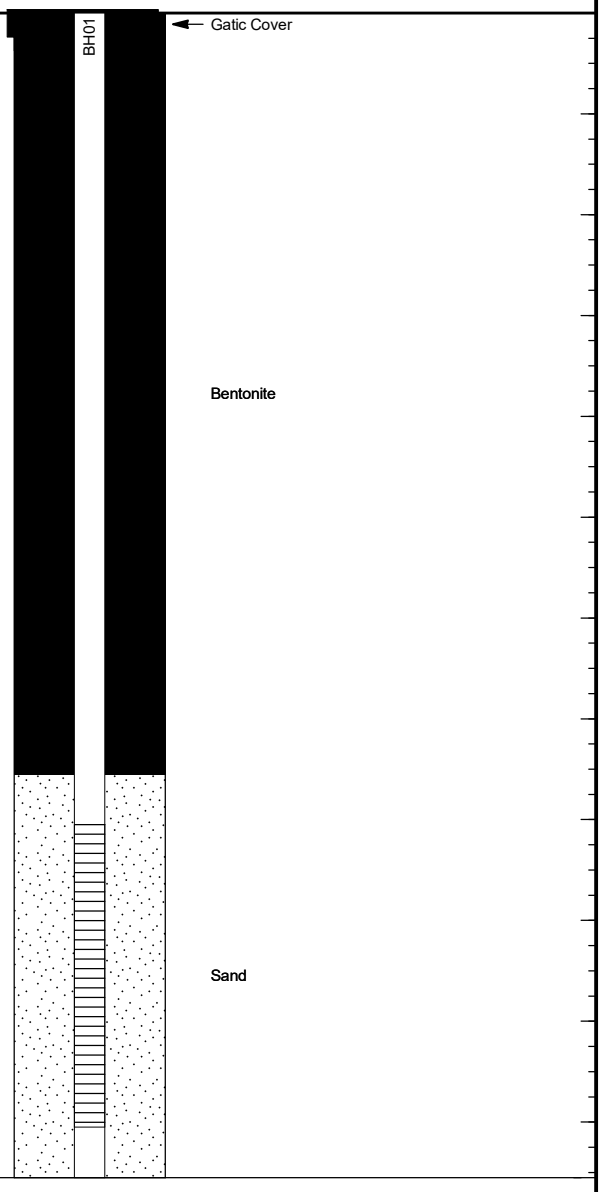
drilling information | **material substance** | **piezometer construction details**

method & support	water	RL (m)	depth (m)	graphic log	material description (refer to engineering log for full description)
HA		20			**FILL**
					EXTREMELY WEATHERED MATERIAL
			4		**CLASS IV HAWKESBURY SANDSTONE**
		16			**CLASS III/II HAWKESBURY SANDSTONE**
	14/05/25		8		
		12			
			12		**CLASS I HAWKESBURY SANDSTONE**
		8			
			16		
		4			
			20		
		0			

D/C — NMLC — HWT

completion details: Flush Gatic
pvc type: 50mm PVC Pipe
sand type: 1-2mm Sand
grout type: N/A

bore construction license: N/A
drilling company: Stratacore
driller: N/A
driller's permit no.: N/A



method & support
see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 — water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	installation date	development date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup	tip	water level
BH01	standpipe				23.10 m			-2.01	

TETRA TECH COFFEY

Engineering Log - Borehole

Borehole ID.	**BH02**
sheet:	1 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**29 Apr 2025**
principal:	
date completed:	**29 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,819.46; N: 6,240,067.43 (GDA2020) | surface elevation: 20.43 m (AHD) | angle from horizontal: 90°

drill model: Massenza MI2, Track mounted | drilling fluid: Water | hole diameter : 52/120

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	soil origin, structure and additional observations
HA, C, AD/T		Not Observed	D	20				**TOPSOIL: SILTY SAND**: fine to medium grained, dark brown, with organic matter, trace fine to medium grained, angular to sub-angular gravel, trace root fibres.	M			**FILL**
			SPT 2, 4, 23/149mm HB N*=R	19	1.0		SC	**FILL: Gravelly SAND**: fine to medium grained, dark brown, fine to medium grained, angular to sub-angular gravel. 0.5 to 0.6 m: orange-brown sand band **FILL: CLAYEY SAND**: fine to coarse grained, orange-brown, with fine grained gravel.		D	HP 130 kPa HP 130 kPa	**EXTREMELY WEATHERED MATERIAL**
				18	2.0			**CLAYEY SAND**: medium to coarse grained, red grading to pale grey, mottled orange-brown, with silt, trace iron induration. Borehole BH02 continued as cored hole				
				17	3.0							
				16	4.0							
				15	5.0							
				14	6.0							
				13	7.0							

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method
DT diatube
AD auger drilling*
AS auger screwing*
HA hand auger
W washbore
RR rock roller

* bit shown by suffix
e.g. AD/T
B blank bit
T TC bit
V V bit

support
M mud
C casing
N nil

penetration
1 2 3 no resistance ranging to refusal

water
10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests
B bulk disturbed sample
D disturbed sample
E environmental sample
SS split spoon sample
U## undisturbed sample ##mm diameter
HP hand penetrometer (kPa)
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
VS vane shear; peak/remouded (kPa)
R refusal
HB hammer bouncing

soil group symbol & material description
based on AS 1726:2017

moisture condition
D dry
M moist
W wet
Wp plastic limit
Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

TETRA TECH COFFEY

Engineering Log - Cored Borehole

Borehole ID.	**BH02**
sheet:	2 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**29 Apr 2025**
principal:	
date completed:	**29 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,819.46; N: 6,240,067.43 (GDA2020) | surface elevation: 20.43 m (AHD) | angle from horizontal: 90°

drill model: Massenza MI2, Track mounted | drilling fluid: Water | hole diameter : 52/120

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description (ROCK TYPE: grain characterisics, colour, structure, minor components)	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		20									
			1.0		started coring at 1.60m						
NMLC	Not Observed 14/05/25	19	2.0		**Sandy CLAY**: medium to high plasticity, orange-red mottled pale grey, medium to coarse grained sand.	RS - XW / MW		d=0.14 a=0.13			**CLASS IV HAWKESBURY SANDSTONE**
		18			**SANDSTONE**: medium to coarse grained, orange-red speckled pale grey, distintly cross bedded at 15°-20°.				88%		Fracture Zone, 80 mm
			3.0		**SANDSTONE**: medium to coarse grained, pale grey speckled pale red, distintly cross bedded at 10°-15°, shale laminations.			d=0.16 a=0.20			SM, Clay, 10 mm
		17			3.35 to 3.68 m: pale grey streaked red						SM, Clay, 60 mm
			4.0					d=0.15 a=0.17			SM, Clay, 100 mm SM, Clay, 20 mm PT, 0 - 5°, UN, RO, Clay SN
		16			4.20 to 4.45 m: pale grey streaked red						PT, 5 - 10°, PL, RO, CN SM, Clay, 10 mm
			5.0					d=0.02 a=0.06	65%		PT, 0 - 5°, UN, RO, Fe SN
		15									SM, Clay, 50 mm SM, Clay, 40 mm SM, Clay, 100 mm SM, Clay, 30 mm PT, 10°, PL, RO, X CO JT, 70°, PL, RO, CN JT, 70°, PL, RO, Fe SN PT, 0 - 10°, PL, RO, CN
			6.0		**SANDSTONE**: medium to coarse grained, pale grey, distintly cross bedded at 10°-15°, shale laminations.	SW		d=0.15 a=0.17			
		14			6.19 to 6.61 m: sandy clay band, medium to high plasticity						**CLASS III/II HAWKESBURY SANDSTONE**
			7.0					d=0.50 a=0.71	83%		
		13			7.10 to 7.20 m: sandstone massive band						SM, Clay, 50 mm
					7.80 to 8.10 m: flat bedded			d=0.94			

method
DT diatube
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
RR rock roller

support
C casing M mud N none

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SS sheared surface
SZ sheared zone
CO contact
CS crushed seam
SM seam

roughness
VR very rough
RO rough
SO smooth
POL polished
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

coating
CN clean
SN stained
VN veneer
CO coating

TETRA TECH COFFEY

Engineering Log - Cored Borehole

Borehole ID.	**BH02**
sheet:	3 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**29 Apr 2025**
principal:	
date completed:	**29 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,819.46; N: 6,240,067.43 (GDA2020) | surface elevation: 20.43 m (AHD) | angle from horizontal: 90°

drill model: Massenza MI2, Track mounted | drilling fluid: Water | hole diameter : 52/120

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
NMLC	Not Observed	12			**SANDSTONE**: medium to coarse grained, pale grey, distintly cross bedded at 10°-15°, shale laminations. *(continued)* 8.12 to 8.75 m: becoming pale grey flecked brown-orange and red	SW		a=1.09	83%		**CLASS III/II HAWKESBURY SANDSTONE** SM, Clay, 30 mm
			9.0			FR		d=1.12 a=0.86			
		11									
			10.0					d=1.45 a=1.06			**CLASS I HAWKESBURY SANDSTONE**
		10							100%		PTx2, 10°, PL, RO, CN
			11.0					d=0.92 a=1.21			
		9									
			12.0		11.82 to 12.30 m: massive			d=1.14 a=1.43			
		8									PT, 15°, PL, RO, CN Fracture zone, 160 mm
			13.0					d=1.25 a=1.86			PT, 5 - 10°, UN, RO, CN
		7							92%		
			14.0					d=1.71 a=2.14			
		6									
			15.0		14.90 to 15.40 m: massive			d=1.27 a=1.71			SM, Clay, 20 mm
		5							98%		
					15.90 to 15.94 m: 35mm shale band			d=0.97 a=0.80			

method
DT diatube
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
RR rock roller

support
C casing M mud N none

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SS sheared surface
SZ sheared zone
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
VR very rough
RO rough
SO smooth
POL polished
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

TETRA TECH COFFEY

Engineering Log - Cored Borehole

Borehole ID.	**BH02**
sheet:	4 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**29 Apr 2025**
principal:	
date completed:	**29 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,819.46; N: 6,240,067.43 (GDA2020) surface elevation: 20.43 m (AHD) angle from horizontal: 90°

drill model: Massenza MI2, Track mounted drilling fluid: Water hole diameter : 52/120

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
NMLC	Not Observed	4	17.0		**SANDSTONE**: medium to coarse grained, pale grey, distintly cross bedded at 10°-15°, shale laminations. *(continued)*	FR		d=1.03 a=0.82	98%		PT, 10°, PL, RO, CN **CLASS I HAWKESBURY SANDSTONE** PT, 10°, PL, RO, CN SM, Clay, 25 mm PT, 5°, PL, RO, CN
		3	18.0					d=1.77 a=1.75			
		2	19.0					d=1.36 a=1.10	96%		SM, Clay, 20 mm PT, 5°, PL, RO, CN
		1	20.0					d=1.22 a=1.26			PT, 5°, UN, RO, Clay VN CS, Clay, 25 mm SM, Clay, 10 mm
		0	21.0					d=1.74 a=0.77 d=1.34 a=1.24			
		-1	22.0		21.60 to 22.30 m: with quartz inclusions				99%		SM, Clay, 20 mm
		-2	23.0					d=1.16 a=1.97	100% 0%		PT, 5°, PL, RO, CN NMLC drill bit was damaged. Drill swap to PCD. No core recovery.
		-3			Borehole BH02 terminated at 23.09 m Target depth						

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method
DT diatube
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
RR rock roller

support
C casing M mud N none

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SS sheared surface
SZ sheared zone
CO contact
CS crushed seam
SM seam

roughness
VR very rough
RO rough
SO smooth
POL polished
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

coating
CN clean
SN stained
VN veneer
CO coating

TETRA TECH COFFEY

Piezometer Installation Log

Hole ID.	**BH02**
sheet:	1 of 1
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**29 Apr 2025**
principal:	
date completed:	**29 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,819.46; N: 6,240,067.43 (GDA2020) | surface elevation: 20.43 m (AHD) | angle from horizontal: 90°

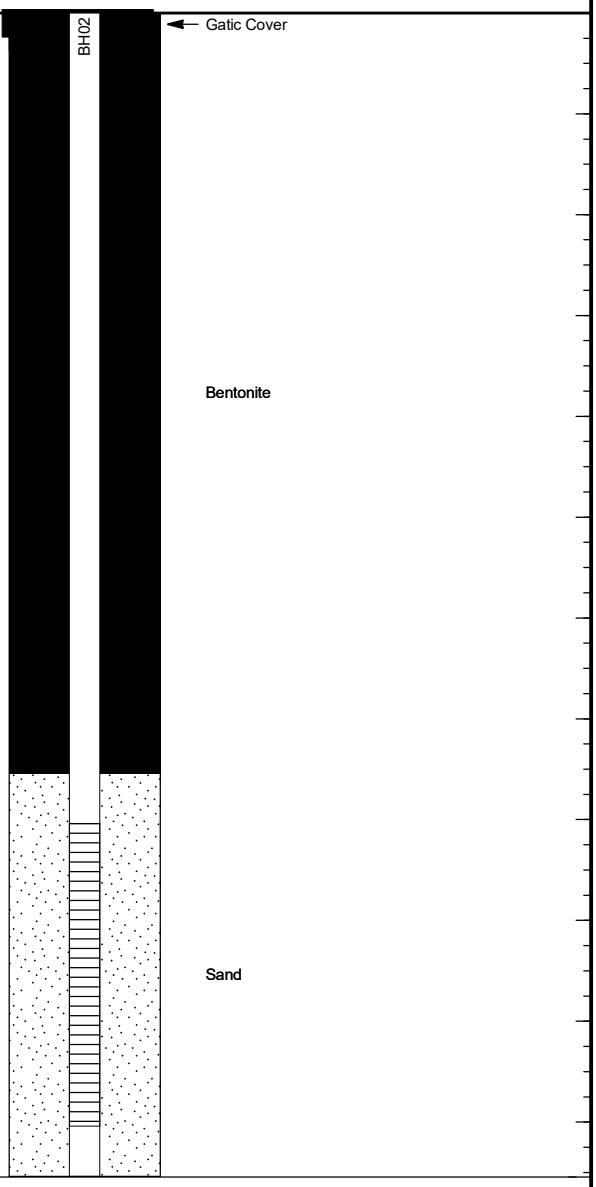
equipment type: Massenza MI2, Track mounted | drilling fluid: Water | hole diameter : 52/120

drilling information | **material substance** | **piezometer construction details**

completion details: Flush Gatic
pvc type: 50mm PVC Pipe
sand type: 1-2mm Sand
grout type: N/A

bore construction license: N/A
drilling company: Stratacore
driller: N/A
driller's permit no.: N/A

method & support	water	RL (m)	depth (m)	graphic log	material description (refer to engineering log for full description)
HA / C	Not Observed; 14/05/25	20	0		**FILL**
					EXTREMELY WEATHERED MATERIAL
		16	4		**CLASS IV HAWKESBURY SANDSTONE**
		12	8		**CLASS III/II HAWKESBURY SANDSTONE**
NMLC / HWT		8	12		**CLASS I HAWKESBURY SANDSTONE**
		4	16		
		0	20		



method & support
see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	installation date	development date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup	tip	water level
BH02	standpipe				23.08 m			-2.65	

TETRA TECH COFFEY

Engineering Log - Borehole

Borehole ID.	**BH03**
sheet:	1 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**28 Apr 2025**
principal:	
date completed:	**28 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,845.22; N: 6,240,064.94 (GDA2020) | surface elevation: 20.01 m (AHD) | angle from horizontal: 90°

drill model: Massenza MI2, Track mounted | drilling fluid: Water | hole diameter : 52/120

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description (SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	soil origin, structure and additional observations
DT		Not Observed		20				**ASPHALT**.				**FILL**
HA			D					**FILL: Gravelly SAND**: fine to medium grained, dark brown-grey mottled dark grey and orange-yellow, gravel is fine to medium and angular to sub-angular, trace silt, trace glass fragments and 110mm length of rebar.	D - M			
			D	19	1.0		SP-SC	**FILL: CLAYEY SAND**: fine to medium grained, dark grey mottled pale brown-yellow, with silt, trace ironstone gravel.				
AD/T			SPT 2, 2, 4 N*=6				CL-CI	**Sandy CLAY**: medium to high plasticity, pale brown and orange mottled pale grey, sand is fine to medium grained, trace fine grained gravel. 1.7 m: becoming pale grey mottled red-brown	<Wp	St	X	**RESIDUAL SOIL** HP 180 kPa HP 130 kPa HP 130 kPa
C				18	2.0			**SAND**: medium to coarse grained, pale red mottled brown.		D - VD		**EXTREMELY WEATHERED MATERIAL** At 2.20m: drilling resistance increased
			SPT 5/50mm HB N*=R					Borehole BH03 continued as cored hole				
				17	3.0							
				16	4.0							
				15	5.0							
				14	6.0							
				13	7.0							

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method
DT diatube; AD auger drilling*; AS auger screwing*; HA hand auger; W washbore; RR rock roller
* bit shown by suffix e.g. AD/T; B blank bit; T TC bit; V V bit

support
M mud; C casing; N nil

penetration
1 2 3 — no resistance ranging to refusal

water
10-Oct-12 water level on date shown; water inflow; water outflow

samples & field tests
B bulk disturbed sample; D disturbed sample; E environmental sample; SS split spoon sample; U## undisturbed sample ##mm diameter; HP hand penetrometer (kPa); N standard penetration test (SPT); N* SPT - sample recovered; Nc SPT with solid cone; VS vane shear; peak/remouded (kPa); R refusal; HB hammer bouncing

soil group symbol & material description based on AS 1726:2017

moisture condition
D dry; M moist; W wet; Wp plastic limit; Wl liquid limit

consistency / relative density
VS very soft; S soft; F firm; St stiff; VSt very stiff; H hard; Fb friable; VL very loose; L loose; MD medium dense; D dense; VD very dense

TETRA TECH COFFEY

Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	2 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**28 Apr 2025**
principal:	
date completed:	**28 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,845.22; N: 6,240,064.94 (GDA2020) surface elevation: 20.01 m (AHD) angle from horizontal: 90°

drill model: Massenza MI2, Track mounted drilling fluid: Water hole diameter : 52/120

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		20									
		19	1.0								
		18	2.0		started coring at 2.65m						
NMLC	I14/05/25rved	17	3.0		**CLAYEY SAND**: fine to coarse grained, pale brown.	XW					**CLASS IV HAWKESBURY SANDSTONE** SM, Clay, 20 mm
					SANDSTONE: medium to coarse grained, pale grey and orange-brown, speckled red, indistinctly cross bedded at 10° - 15°. 3.30 m: becoming red-purple mottled pale grey	MW		d=0.12 a=0.20	75%		
		16	4.0					d=0.26 a=0.33			SM, Clay, 80 mm PT, 10°, PL, Fe healed PT, 10°, PL, RO, Fe SN SM, Clay, 70 mm PT, 10°, PL, Clay, closed JT, 70°, PL, RO, CN
					SANDSTONE: medium to coarse grained, pale grey, bands of red and orange-brown, indistinctly cross bedded at 10° - 15°.	SW		d=0.15 a=0.14			Fracture Zone, Fe SN, 80 mm SM, Clay, 50 mm CS, 30 mm PT, 15°, PL, RO, Fe SN
		15	5.0								Fracture zone, Fe SN, 60 mm
		14	6.0					d=0.33 a=0.43	86%		**CLASS III/II HAWKESBURY SANDSTONE** PT, 5°, PL, RO, CN PT, 5°, PL, RO, CN PT, 0 - 5°, UN, RO, Clay CO - Fe SN SM, Clay, 20 mm
		13	7.0		7.08 m: becoming distinctly cross bedded at 10° - 15°			d=0.47 a=0.55			
								d=0.23	97%		

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method
DT diatube
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
RR rock roller

support
C casing M mud N none

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SS sheared surface
SZ sheared zone
CO contact
CS crushed seam
SM seam

roughness
VR very rough
RO rough
SO smooth
POL polished
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

coating
CN clean
SN stained
VN veneer
CO coating

TETRA TECH COFFEY

Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	3 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**28 Apr 2025**
principal:	
date completed:	**28 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,845.22; N: 6,240,064.94 (GDA2020) | surface elevation: 20.01 m (AHD) | angle from horizontal: 90°

drill model: Massenza MI2, Track mounted | drilling fluid: Water | hole diameter : 52/120

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral)	samples, field tests & Is(50) (MPa) (a = axial; d = diametral)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
NMLC	Not Observed	12					a=0.29			SM, Clay, 90 mm **CLASS III/II HAWKESBURY SANDSTONE**
		11	9.0	**SANDSTONE**: medium to coarse grained, pale grey mottled orange-brown speckled red-purple, indistinctly cross bedded at 10° - 15°.	SW		d=1.21 a=1.12			
		10	10.0	**SANDSTONE**: medium to coarse grained, pale grey flecked orange-brown, grading to pale grey, distinctly cross bedded at 10° - 15°.	FR		d=1.07 a=1.62	97%		**CLASS I HAWKESBURY SANDSTONE** PT, 0 - 5°, UN, RO, CN PT, 5 - 10°, UN, RO, CN
		9	11.0				d=1.08 a=1.50			PT, 15°, PL, RO, CN SM, Clay, 5 mm
		8	12.0				d=1.69 a=1.59	97%		PT, 10°, PL, RO, X CO
		7	13.0	12.75 to 12.79 m: siltstone nodule, up to 40 mm thick 12.83 to 12.94 m: pale grey mottled orange-brown 13.18 to 13.25 m: siltstone lamination, distinctly laminated at 15°			d=1.36 a=2.44			PT, 5 - 15°, UN, RO, CN SM, Clay, 30 mm
		6	14.0	**SANDSTONE**: medium to coarse grained, pale grey, massive.			d=1.23 a=1.44			
		5	15.0	14.71 to 14.79 m: distinctly cross bedded at 0° - 10° band			d=1.34 a=1.61	100%		PT, 10°, PL, RO, CN PT, 5 - 10°, UN, RO, CN CS, 10 mm PT, 10°, PL, RO, CN PT, 10°, PL, RO, CN
				15.35 to 15.55 m: distinctly cross bedded at 10° - 15° band			d=1.26			

method
DT diatube
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
RR rock roller

support
C casing M mud N none

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SS sheared surface
SZ sheared zone
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
VR very rough
RO rough
SO smooth
POL polished
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

TETRA TECH COFFEY

Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	4 of 4
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**28 Apr 2025**
principal:	
date completed:	**28 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,845.22; N: 6,240,064.94 (GDA2020) surface elevation: 20.01 m (AHD) angle from horizontal: 90°

drill model: Massenza MI2, Track mounted drilling fluid: Water hole diameter : 52/120

drilling information				material substance					rock mass defects		
method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
NMLC	Not Observed	4			**SANDSTONE**: medium to coarse grained, pale grey, indistinctly cross bedded at 10° - 15°. *(continued)*	FR		a=0.68	100%		**CLASS I HAWKESBURY SANDSTONE**
		3	17.0					d=1.54 a=1.67			PT, 10°, PL, RO, Clay VN CS, 30 mm
		2	18.0					d=1.18 a=1.26	98%		PT, 15°, PL, RO, Clay CO SM, Clay, 60 mm
		1	19.0		18.80 m: becoming pale grey-yellow			d=0.81 a=1.23			
		0	20.0					d=1.53 a=1.71	100%		SM, Clay, 10 mm PT, 5 - 10°, UN, RO, CN
		-1	21.0					d=1.06 a=1.03			
		-2	22.0					d=1.41 a=1.76	100%		
		-3	23.0					d=0.68 a=1.22			
					23.20 m: medium vitrinite coal band Borehole BH03 terminated at 23.22 m Target depth						

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method
DT diatube
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
RR rock roller

support
C casing M mud N none

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SS sheared surface
SZ sheared zone
CO contact
CS crushed seam
SM seam

roughness
VR very rough
RO rough
SO smooth
POL polished
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

coating
CN clean
SN stained
VN veneer
CO coating

TETRA TECH COFFEY

Piezometer Installation Log

Hole ID.	**BH03**
sheet:	1 of 1
project no.	**754-SYDGE381816**
client:	**Akalan Project Pty Ltd**
date started:	**28 Apr 2025**
principal:	
date completed:	**28 Apr 2025**
project:	**St George Private Hospital**
logged by:	**RZ/EO**
location:	**Refer to Site Plan**
checked by:	**IG**

position: E: 327,845.22; N: 6,240,064.94 (GDA2020) | surface elevation: 20.01 m (AHD) | angle from horizontal: 90°

equipment type: Massenza MI2, Track mounted | drilling fluid: Water | hole diameter : 52/120

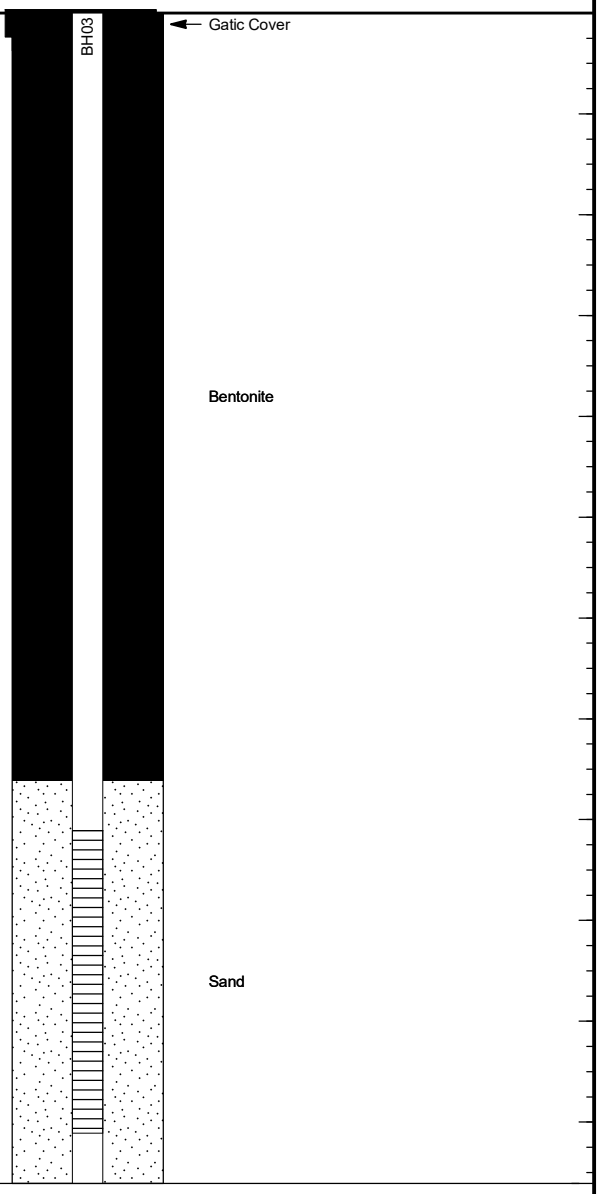
drilling information | **material substance** | **piezometer construction details**

completion details: Flush Gatic
pvc type: 50mm PVC Pipe
sand type: 1-2mm Sand
grout type: N/A

bore construction license: N/A
drilling company: Stratacore
driller: N/A
driller's permit no.: N/A

material description (refer to engineering log for full description)	RL (m)	depth (m)
FILL	20	
RESDIUAL SOIL		
EXTREMELY WEATHERED MATERIAL		
CLASS IV HAWKESBURY SANDSTONE	16	4
CLASS III/II HAWKESBURY SANDSTONE	12	8
CLASS I HAWKESBURY SANDSTONE	8	12
	4	16
	0	20

method & support: AD/T, C, NMLC, HWT
water: Not Observed; 14/05/25



method & support see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	installation date	development date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup	tip	water level
BH03	standpipe				23.22 m			-3.21	

APPENDIX C: LABORATORY TEST RESULTS

MOISTURE CONTENT TEST REPORT

Client	Tetra Tech Coffey	**Job #**	S25228-1
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Report #**	S105938-MC
Project	St George Private Hospital - SYDGE381816		

Test Procedure

- ☑ AS 1289 2.1.1 Determination of the moisture content of a soil - Oven drying method (Standard method).
- ☐ AS4133 1.1.1 Determination of the moisture content of rock - Oven drying method (standard method)
- ☐ RMS T120 Moisture content of road construction materials (Standard method)
- ☐ RMS T262 Determination of moisture content of aggregates (Standard method)

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 29/05/2025

Preparation Prepared in accordance with the test method **Date Tested** 19/05/2025

Sample #	Source	Sample Description	Moisture Content %
S105938	BH02_1.0-1.3	Clayey SAND with Gravel and Silt	**15.0**
S105939	BH02_1.3-1.45	Clayey SAND with Silt	**9.4**
S105940	BH03_1.0-1.2	SAND with Clay and Silt, trace of Gravel	**17.8**
S105941	BH03_1.5-1.95	Sandy CLAY trace of Gravel	**17.7**

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Jacob Lloyd

3/06/2025

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Particle Size Distribution with Hydrometer Report

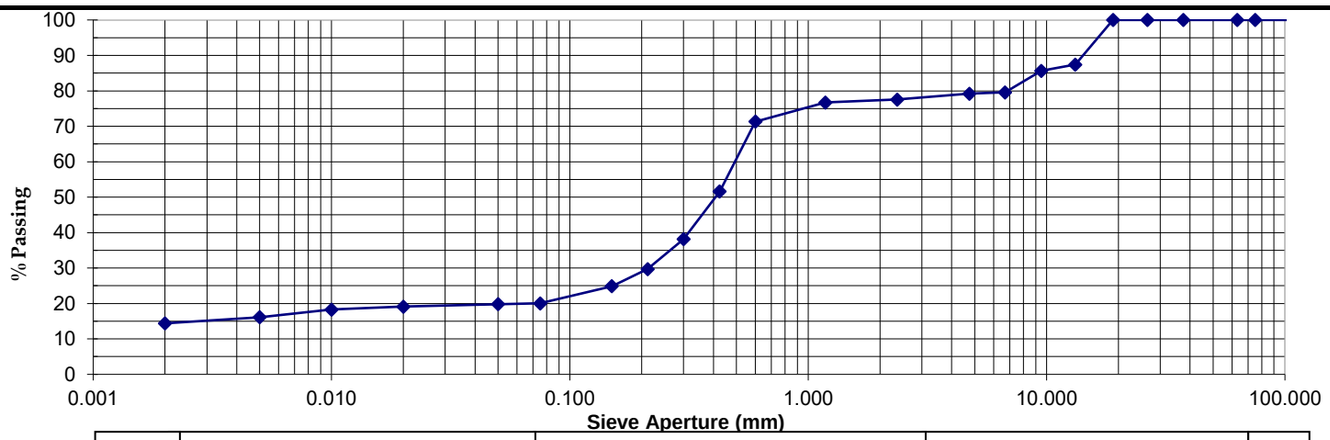
Client	Tetra Tech Coffey	**Source**	BH02_1.0-1.3
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Clayey SAND with Gravel and Silt
Project	St George Private Hospital - SYDGE381816	**Report No**	S105938-HYD
Job No	S25228-1	**Lab No**	S105938

Test Procedure AS1289.3.6.3 Determination of the particle size distribution of a soil - Standard method of fine analysis using a hydrometer

AS1289.3.6.1 Determination of particle size distribution of a soil standard method sieving

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 29/05/2025

Preparation Prepared in accordance with the test method **Date Tested** 3/06/2025



Clay	Silt	Sand	Gravel	Cobbles

Sieve Aperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	-		1.180	77	
75	-		0.600	71	
63	-		0.425	52	
37.5	-		0.300	38	
26.5	-		0.212	30	
19.0	100		0.150	25	
13.2	87		0.075	20	
9.5	86		0.050	20	
6.7	80		0.020	19	
4.75	79		0.010	18	
2.36	78		0.005	16	
			0.002	14	

Loss in Pre-treatment of Material (%):	0	Particle Density (t/m^3):	2.66
Method of Dispersion:	Sodium Hexametaphosphate / Sodium Carbonate	Measured in accordance with AS 1289.3.5.1	
Method of Preparation:	As received from natural state	Hydrometer Type:	ASTM E100

Notes

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Authorised Signatory: Date: 3/06/2025

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Lidcombe NSW 2141

SOIL PARTICLE DENSITY REPORT

Client	Tetra Tech Coffey	**Source**	BH02_1.0-1.3
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Clayey SAND with Gravel and Silt
Project	St George Private Hospital - SYDGE381816	**Report #**	S105938-SPD
Job #	S25228-1	**Lab #**	S105938

Test Procedure ☑ AS1289 3.5.1 (2006) Soil classification tests - Determination of the soil particle density of a soil - Standard method

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 29/05/2025

Preparation Prepared in accordance with the test method **Date Tested** 27/05/2025

Average Apparent Particle Density: Fraction Retained 2.36mm (g/cm^3)	*
Average Apparent Particle Density: Fraction Passing 2.36mm (g/cm^3)	**2.66**
Soil Particle Density: Total Soil Sample (g/cm^3)	*

** Value unable to be determined due to limited amount of sample.*

Notes

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NATA Accredited Laboratory Number: 14874

Jacob Lloyd

3/06/2025

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Particle Size Distribution with Hydrometer Report

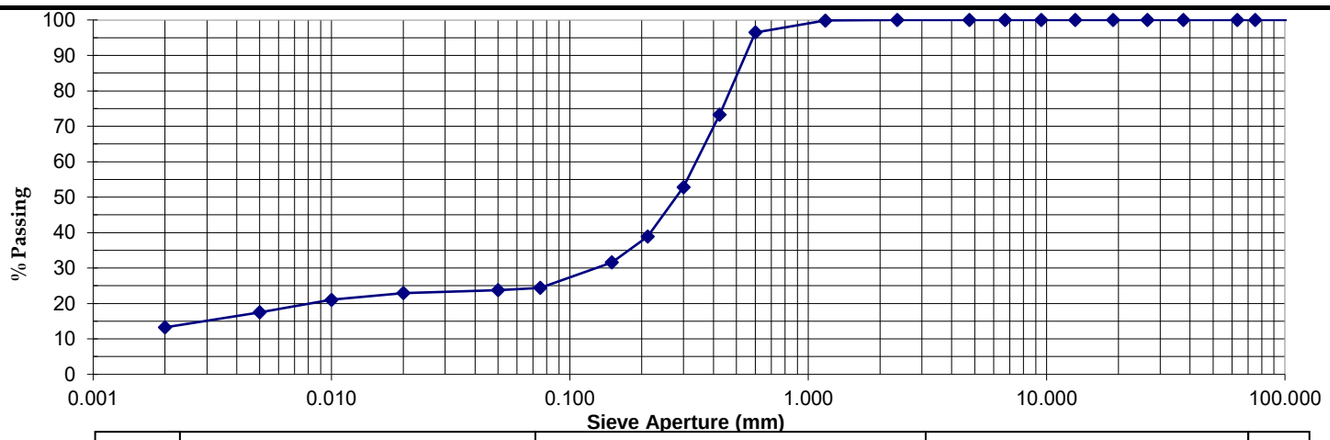
Client	Tetra Tech Coffey	**Source**	BH02_1.3-1.45
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Clayey SAND with Silt
Project	St George Private Hospital - SYDGE381816	**Report No**	S105939-HYD
Job No	S25228-1	**Lab No**	S105939

Test Procedure AS1289.3.6.3 Determination of the particle size distribution of a soil - Standard method of fine analysis using a hydrometer

AS1289.3.6.1 Determination of particle size distribution of a soil standard method sieving

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 29/05/2025

Preparation Prepared in accordance with the test method **Date Tested** 3/06/2025



Clay	Silt	Sand	Gravel	Cobbles

Sieve Aperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	-		1.180	100	
75	-		0.600	96	
63	-		0.425	73	
37.5	-		0.300	53	
26.5	-		0.212	39	
19.0	-		0.150	32	
13.2	-		0.075	24	
9.5	-		0.050	24	
6.7	-		0.020	23	
4.75	-		0.010	21	
2.36	100		0.005	17	
			0.002	13	

Loss in Pre-treatment of Material (%):	0	Particle Density (t/m^3):	2.6
Method of Dispersion:	Sodium Hexametaphosphate / Sodium Carbonate	Measured in accordance with AS 1289.3.5.1	
Method of Preparation:	As received from natural state	Hydrometer Type:	ASTM E100

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory: Date: 3/06/2025

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Lidcombe NSW 2141

SOIL PARTICLE DENSITY REPORT

Client	Tetra Tech Coffey	**Source**	BH02_1.3-1.45
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Clayey SAND with Silt
Project	St George Private Hospital - SYDGE381816	**Report #**	S105939-SPD
Job #	S25228-1	**Lab #**	S105939

Test Procedure ☑ AS1289 3.5.1 (2006) Soil classification tests - Determination of the soil particle density of a soil - Standard method

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 29/05/2025

Preparation Prepared in accordance with the test method **Date Tested** 27/05/2025

Average Apparent Particle Density: Fraction Retained 2.36mm (g/cm^3)	*
Average Apparent Particle Density: Fraction Passing 2.36mm (g/cm^3)	**2.60**
Soil Particle Density: Total Soil Sample (g/cm^3)	*

** Value unable to be determined due to limited amount of sample.*

Notes

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NATA Accredited Laboratory Number: 14874

Jacob Lloyd

3/06/2025

Date:

Macquarie Geotechnical
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Lidcombe NSW 2141

Particle Size Distribution with Hydrometer Report

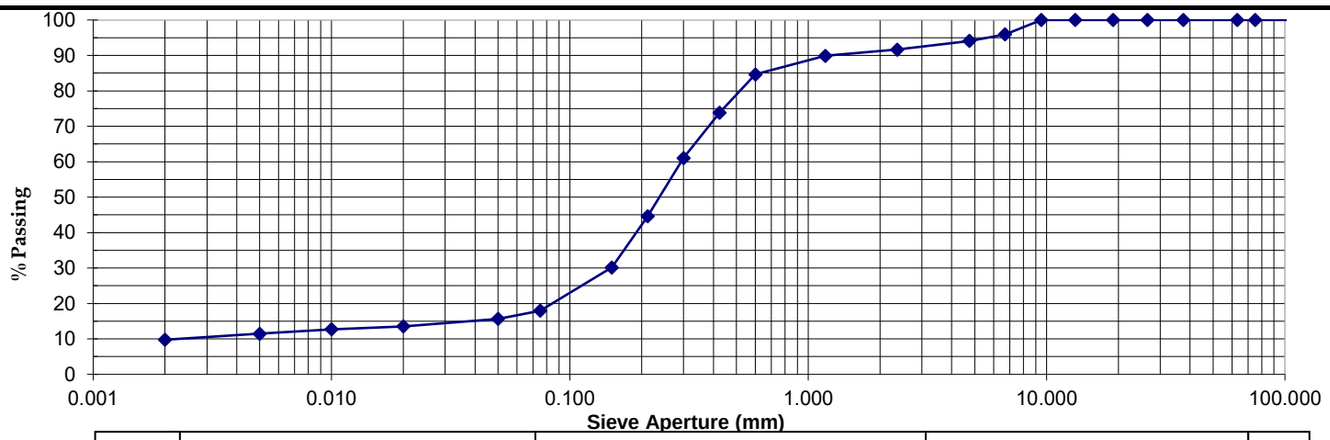
Client	Tetra Tech Coffey	**Source**	BH03_1.0-1.2
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	SAND with Clay and Silt, trace of Gravel
Project	St George Private Hospital - SYDGE381816	**Report No**	S105940-HYD
Job No	S25228-1	**Lab No**	S105940

Test Procedure AS1289.3.6.3 Determination of the particle size distribution of a soil - Standard method of fine analysis using a hydrometer

AS1289.3.6.1 Determination of particle size distribution of a soil standard method sieving

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 28/05/2025

Preparation Prepared in accordance with the test method **Date Tested** 3/06/2025



Clay	Silt	Sand	Gravel	Cobbles

Sieve Aperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	-		1.180	90	
75	-		0.600	85	
63	-		0.425	74	
37.5	-		0.300	61	
26.5	-		0.212	45	
19.0	-		0.150	30	
13.2	-		0.075	18	
9.5	100		0.050	16	
6.7	96		0.020	14	
4.75	94		0.010	13	
2.36	92		0.005	11	
			0.002	10	

Loss in Pre-treatment of Material (%):	0	Particle Density (t/m^3):	2.62
Method of Dispersion:	Sodium Hexametaphosphate / Sodium Carbonate	Measured in accordance with AS 1289.3.5.1	
Method of Preparation:	As received from natural state	Hydrometer Type:	ASTM E100

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory: Date: 3/06/2025

Jacob Lloyd

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14 Carter St
Lidcombe NSW 2141

SOIL PARTICLE DENSITY REPORT

Client	Tetra Tech Coffey	**Source**	BH03_1.0-1.2
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	SAND with Clay and Silt, trace of Gravel
Project	St George Private Hospital - SYDGE381816	**Report #**	S105940-SPD
Job #	S25228-1	**Lab #**	S105940

Test Procedure ☑ AS1289 3.5.1 (2006) Soil classification tests - Determination of the soil particle density of a soil - Standard method

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 28/05/2025

Preparation Prepared in accordance with the test method **Date Tested** 29/05/2025

Average Apparent Particle Density: Fraction Retained 2.36mm (g/cm^3)	*
Average Apparent Particle Density: Fraction Passing 2.36mm (g/cm^3)	**2.62**
Soil Particle Density: Total Soil Sample (g/cm^3)	*

** Value unable to be determined due to limited amount of sample.*

Notes

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NATA Accredited Laboratory Number: 14874

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3/06/2025

Date:

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14 Carter St
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Particle Size Distribution with Hydrometer Report

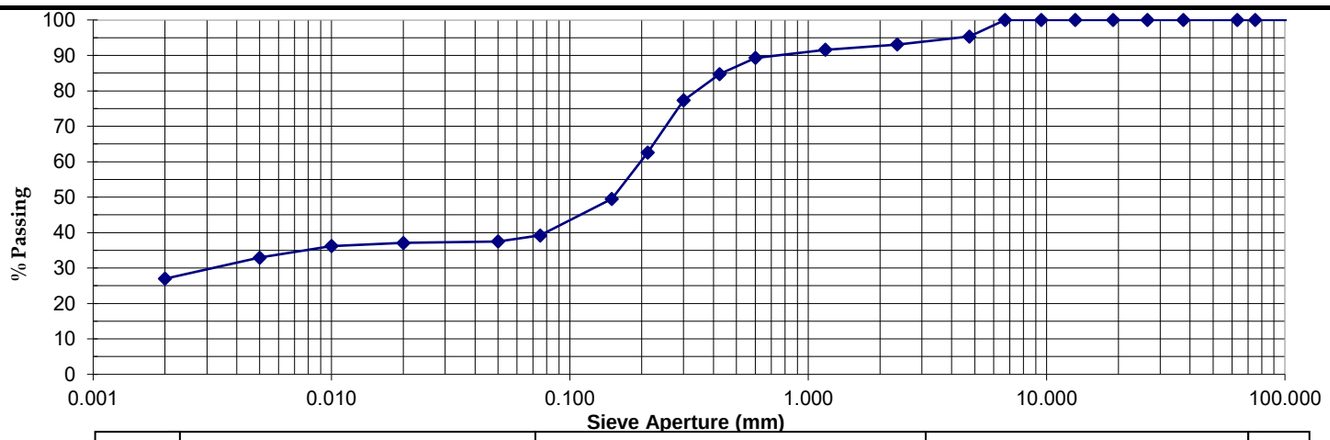
Client	Tetra Tech Coffey	**Source**	BH03_1.5-1.95
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandy CLAY trace of Gravel
Project	St George Private Hospital - SYDGE381816	**Report No**	S105941-HYD
Job No	S25228-1	**Lab No**	S105941

Test Procedure AS1289.3.6.3 Determination of the particle size distribution of a soil - Standard method of fine analysis using a hydrometer

AS1289.3.6.1 Determination of particle size distribution of a soil standard method sieving

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 28/05/2025

Preparation Prepared in accordance with the test method **Date Tested** 3/06/2025



Clay	Silt	Sand	Gravel	Cobbles

Sieve Aperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	-		1.180	92	
75	-		0.600	89	
63	-		0.425	85	
37.5	-		0.300	77	
26.5	-		0.212	63	
19.0	-		0.150	50	
13.2	-		0.075	39	
9.5	-		0.050	38	
6.7	100		0.020	37	
4.75	95		0.010	36	
2.36	93		0.005	33	
			0.002	27	

Loss in Pre-treatment of Material (%):	0	Particle Density (t/m^3):	2.67
Method of Dispersion:	Sodium Hexametaphosphate / Sodium Carbonate	Measured in accordance with AS 1289.3.5.1	
Method of Preparation:	As received from natural state	Hydrometer Type:	ASTM E100

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory: Date: 3/06/2025

Jacob Lloyd

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Lidcombe NSW 2141

SOIL CLASSIFICATION REPORT

Client	Tetra Tech Coffey	**Source**	BH03_1.5-1.95
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandy CLAY trace of Gravel
Project	St George Private Hospital - SYDGE381816	**Report No.**	S105941-PI
Job No.	S25228-1	**Lab No.**	S105941

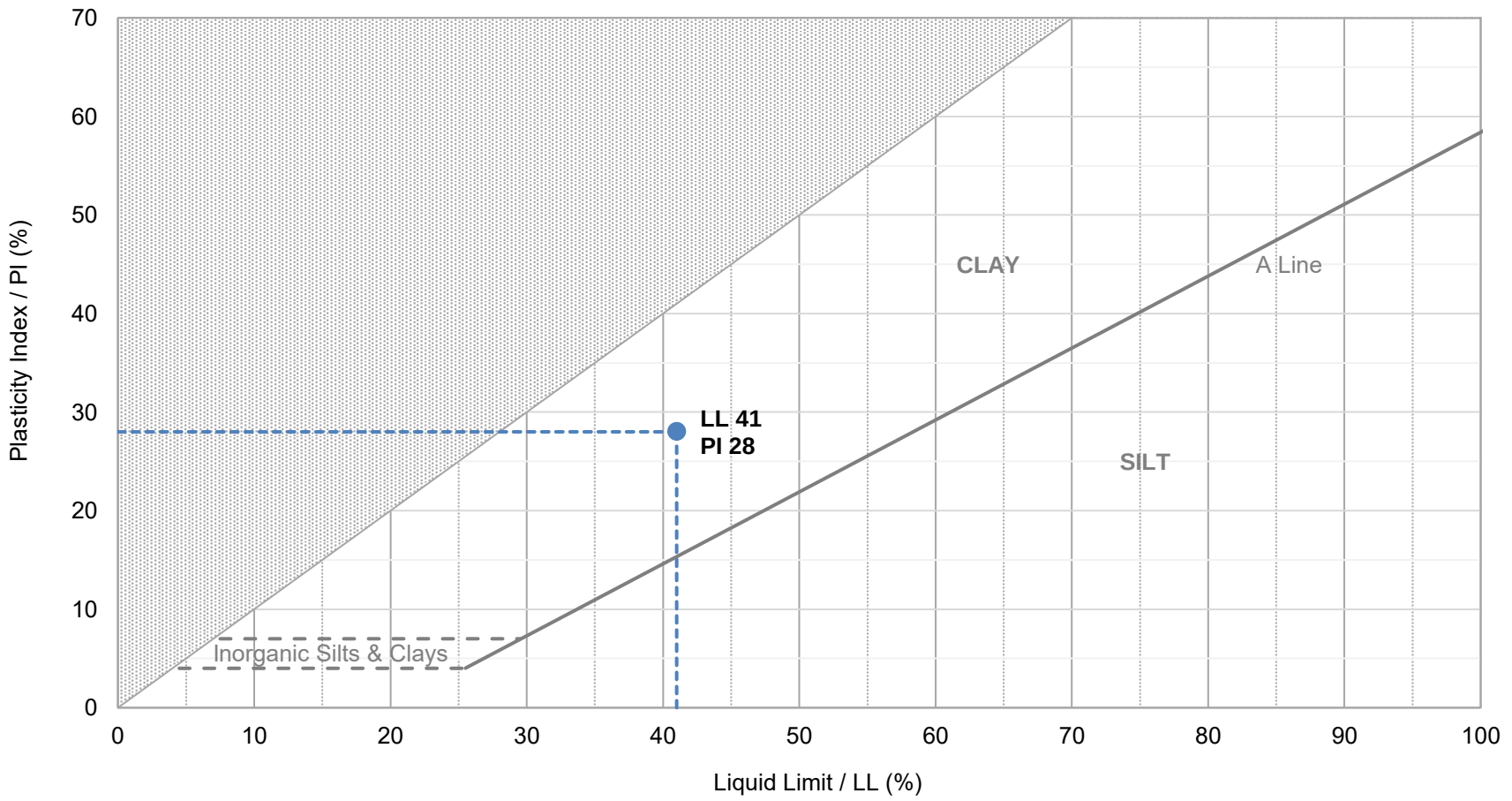
Test Procedure

☐	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☑	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	28/05/2025
Preparation	Prepared in accordance with the test method	**Date Tested**	26/05/2025

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		Results	
Method of Preparation	**Dry Sieved**	Liquid Limit / LL (%)	**41**
History of the Sample	**Air Dried**	Plastic Limit (%)	**13**
		Plasticity Index / PI (%)	**28**
		Linear Shrinkage (%)	**12.0**
		Condition upon Drying	**Linear**

Notes

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Authorised Signatory:

Jacob Lloyd

3/06/2025

Date:

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14 Carter St
Lidcombe NSW 2141

SOIL PARTICLE DENSITY REPORT

Client	Tetra Tech Coffey	**Source**	BH03_1.5-1.95
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandy CLAY trace of Gravel
Project	St George Private Hospital - SYDGE381816	**Report #**	S105941-SPD
Job #	S25228-1	**Lab #**	S105941

Test Procedure ☑ AS1289 3.5.1 (2006) Soil classification tests - Determination of the soil particle density of a soil - Standard method

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 28/05/2025

Preparation Prepared in accordance with the test method **Date Tested** 28/05/2025

Average Apparent Particle Density: Fraction Retained 2.36mm (g/cm^3)	*
Average Apparent Particle Density: Fraction Passing 2.36mm (g/cm^3)	**2.67**
Soil Particle Density: Total Soil Sample (g/cm^3)	*

** Value unable to be determined due to limited amount of sample.*

Notes

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NATA Accredited Laboratory Number: 14874

Jacob Lloyd

3/06/2025

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Tetra Tech Coffey	**Sample Source**	BH01_6.40-6.73
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105942-UCS
Job #	S25228-1	**Sample #**	S105942

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	30/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 19 MPa

Date Tested:	21/05/2025		Moisture Content:	6.4	%
Specimen Height:	145.1	mm	Duration of Test:	641	seconds
Average Specimen Diameter:	51.6	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Single shear plane				
Other Pertinent Observations:					

Accredited for compliance with ISO/IEC 17025 - Testing.

Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 27/05/2025

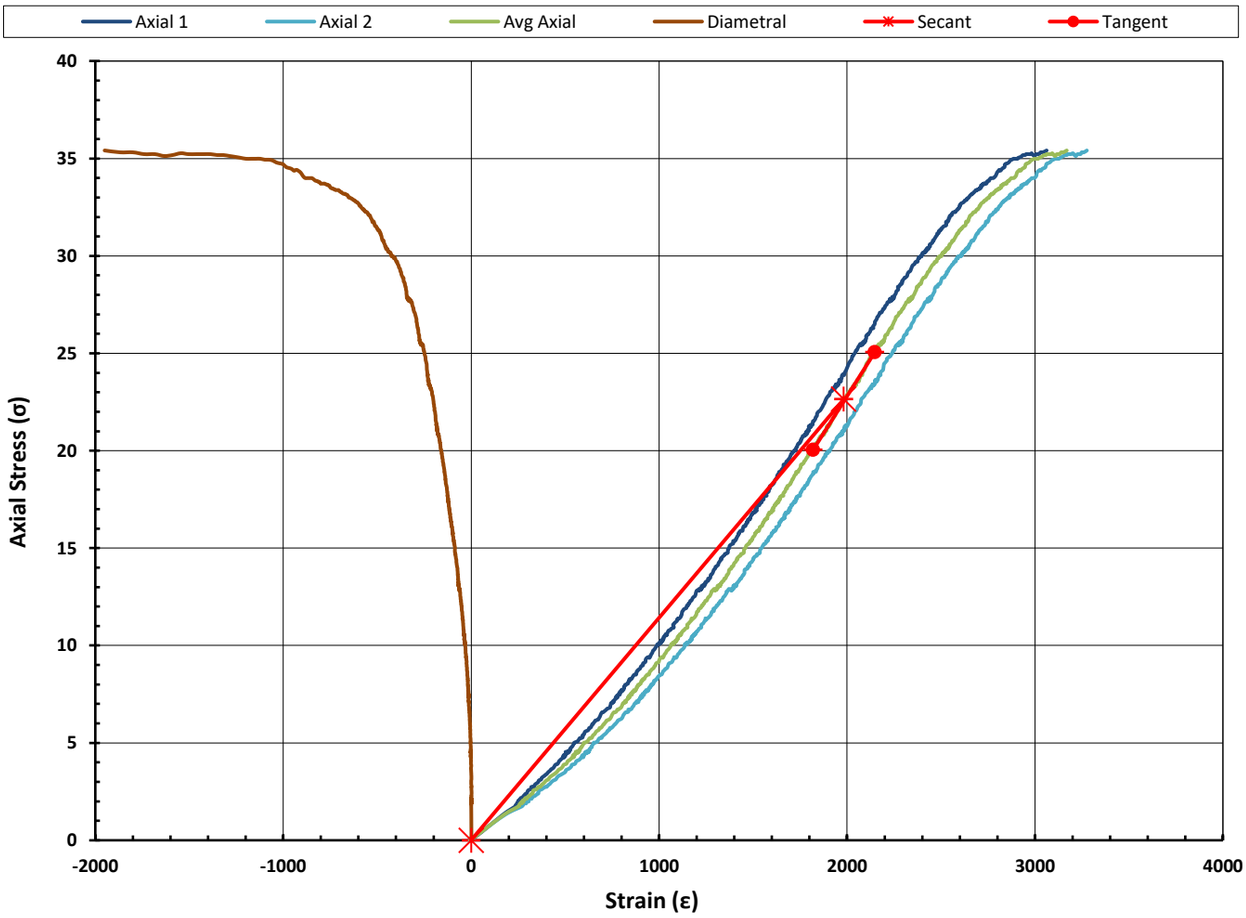
Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Deformability of Rock Materials in Uniaxial Compression

Client	Tetra Tech Coffey	**Sample Source**	BH01_13.43-13.68
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105943-MOD
Job #	S25228-1	**Sample #**	S105943

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	30/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Axial Stress vs Strain Plots



Uniaxial Compressive Strength	**35**	**MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	15 GPa	0.12	from 56 % to 71 % of Max UCS
Secant	11 GPa	0.10	from 0 % to 64 % of Max UCS

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

Date: 27/05/2025

Macquarie Geotechnical
14 Carter Street
Lidcombe NSW 2141

Deformability of Rock Materials in Uniaxial Compression

Client	Tetra Tech Coffey	**Sample Source**	BH01_13.43-13.68
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105943-MOD
Job #	S25228-1	**Sample #**	S105943

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	30/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Average Specimen Diameter (mm)	51.9	**Moisture Content (%)**	6.7
Average Specimen Height (mm)	143.9	**Wet Density (t/m^3)**	2.40
Length to Diameter Ratio	2.8	**Dry Density (t/m^3)**	2.25
Duration of Test (min)	11.38	**Rate of Displacement (mm/min):**	< 0.1
Date of Test:	21/5/25	**Specimen Curing**	-
Mode of Failure	Single shear plane	**Test Apparatus**	Matest Compression Machine with Axial and Circumferential Extensometers.

Before Test

After Test

Uniaxial Compressive Strength **35** **MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	15 GPa	0.12	from 56 % to 71 % of Max UCS
Secant	11 GPa	0.10	from 0 % to 64 % of Max UCS

Accredited for compliance with ISO/IEC 17025 - Testing.

Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 27/05/2025

Macquarie Geotechnical
14 Carter Street
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Tetra Tech Coffey	**Sample Source**	BH01_19.12-19.33
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105944-UCS
Job #	S25228-1	**Sample #**	S105944

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	30/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 42 MPa

Date Tested:	21/05/2025		Moisture Content:	6.4	%
Specimen Height:	144.5	mm	Duration of Test:	722	seconds
Average Specimen Diameter:	51.9	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Mixed mode				
Other Pertinent Observations:					

NATA

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Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 27/05/2025

MACQUARIE GEOTECH

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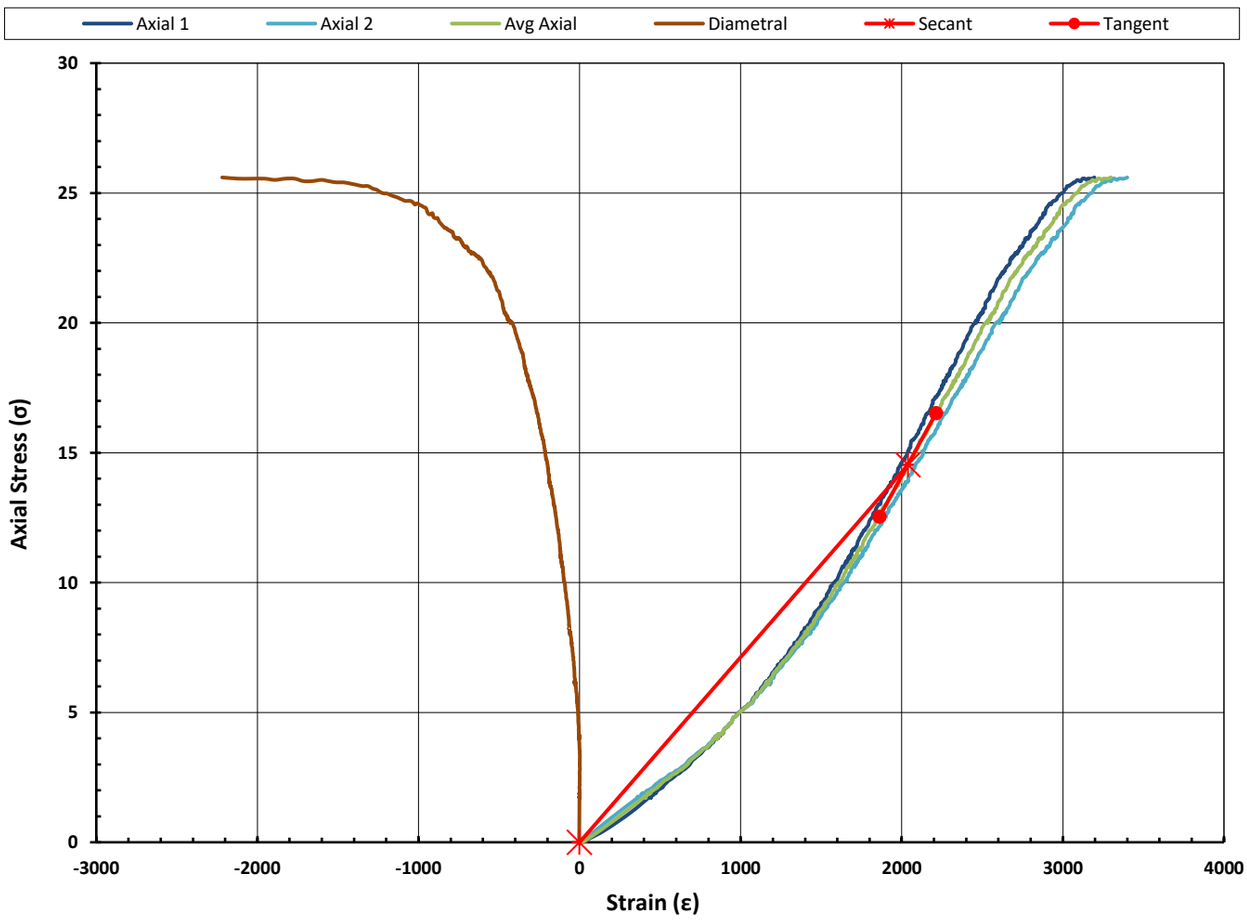
14 Carter St
Lidcombe NSW 2141

Deformability of Rock Materials in Uniaxial Compression

Client	Tetra Tech Coffey	**Sample Source**	BH02_8.13-8.36
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105945-MOD
Job #	S25228-1	**Sample #**	S105945

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	29/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Axial Stress vs Strain Plots



Uniaxial Compressive Strength **26** **MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	11 GPa	0.12	from 49 % to 64 % of Max UCS
Secant	7.1 GPa	0.10	from 0 % to 57 % of Max UCS

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

Date: 27/05/2025

Macquarie Geotechnical
14 Carter Street
Lidcombe NSW 2141

Deformability of Rock Materials in Uniaxial Compression

Client	Tetra Tech Coffey	**Sample Source**	BH02_8.13-8.36
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105945-MOD
Job #	S25228-1	**Sample #**	S105945

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	29/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Average Specimen Diameter (mm)	51.8	**Moisture Content (%)**	8.8
Average Specimen Height (mm)	144.7	**Wet Density (t/m^3)**	2.31
Length to Diameter Ratio	2.8	**Dry Density (t/m^3)**	2.13
Duration of Test (min)	10.58	**Rate of Displacement (mm/min):**	< 0.1
Date of Test:	21/5/25	**Specimen Curing**	-
Mode of Failure	Single shear plane	**Test Apparatus**	Matest Compression Machine with Axial and Circumferential Extensometers.

Before Test

After Test

Uniaxial Compressive Strength **26** **MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	11 GPa	0.12	from 49 % to 64 % of Max UCS
Secant	7.1 GPa	0.10	from 0 % to 57 % of Max UCS

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Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 27/05/2025

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Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Tetra Tech Coffey	**Sample Source**	BH02_15.0-15.26
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105946-UCS
Job #	S25228-1	**Sample #**	S105946

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	29/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 26 MPa

Date Tested:	21/05/2025		Moisture Content:	9.1	%
Specimen Height:	143.5	mm	Duration of Test:	684	seconds
Average Specimen Diameter:	51.6	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Single shear plane				
Other Pertinent Observations:					

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Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 27/05/2025

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Tetra Tech Coffey	**Sample Source**	BH02_20.14-20.42
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105947-UCS
Job #	S25228-1	**Sample #**	S105947

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	29/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 22 MPa

Date Tested:	22/05/2025		Moisture Content:	8.7	%
Specimen Height:	145.1	mm	Duration of Test:	659	seconds
Average Specimen Diameter:	51.7	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Single shear plane				
Other Pertinent Observations:					

Accredited for compliance with ISO/IEC 17025 - Testing.

Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 27/05/2025

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Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Tetra Tech Coffey	**Sample Source**	BH03_10.46-10.75
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105948-UCS
Job #	S25228-1	**Sample #**	S105948

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	28/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 28 MPa

Date Tested:	22/05/2025		Moisture Content:	6.7	%
Specimen Height:	143.8	mm	Duration of Test:	697	seconds
Average Specimen Diameter:	51.5	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Single shear plane				
Other Pertinent Observations:					

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Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 27/05/2025

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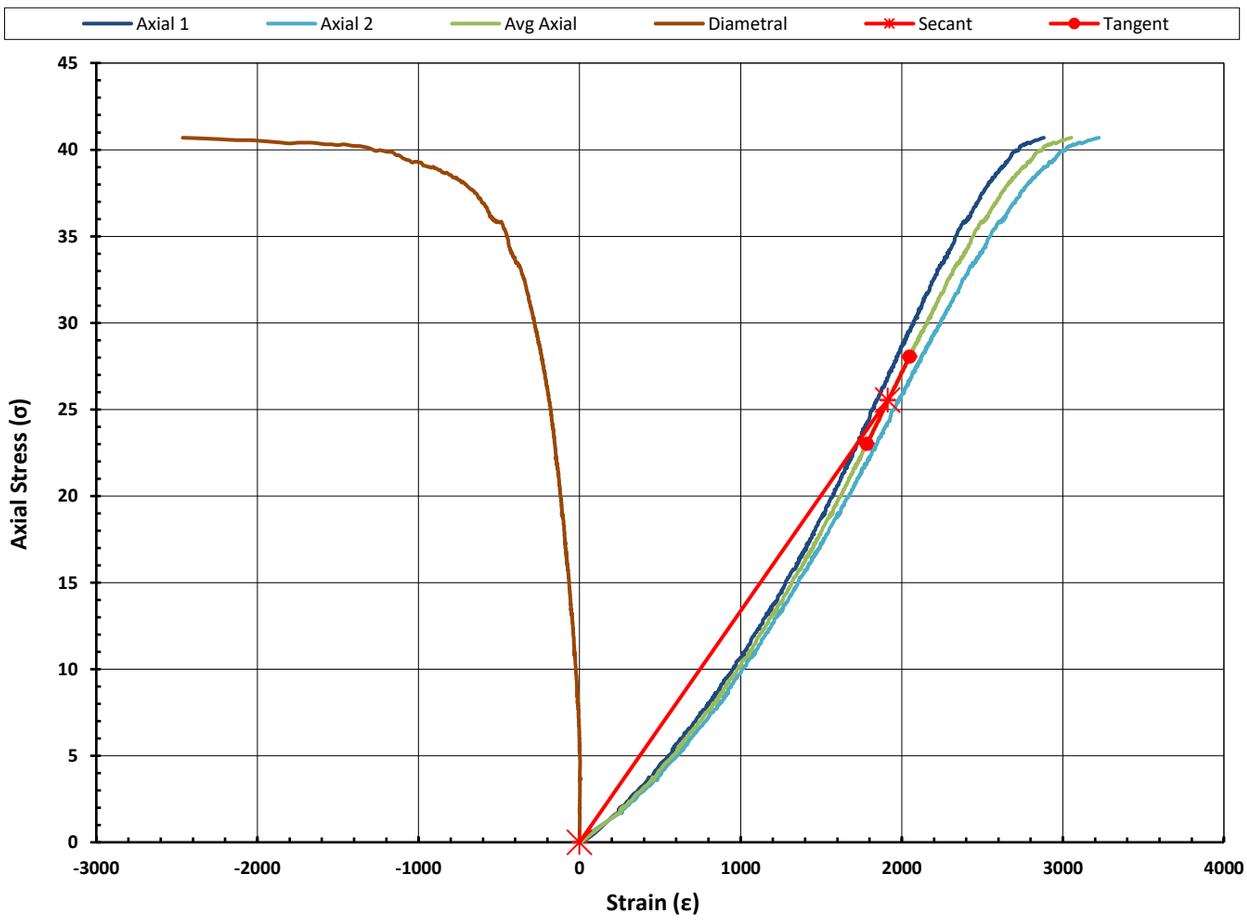
14 Carter St
Lidcombe NSW 2141

Deformability of Rock Materials in Uniaxial Compression

Client	Tetra Tech Coffey	**Sample Source**	BH03_17.16-17.39
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105949-MOD
Job #	S25228-1	**Sample #**	S105949

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	28/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Axial Stress vs Strain Plots



Uniaxial Compressive Strength **41** **MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	19 GPa	0.11	from 57 % to 69 % of Max UCS
Secant	13 GPa	0.10	from 0 % to 63 % of Max UCS

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

Date: 27/05/2025

Macquarie Geotechnical
14 Carter Street
Lidcombe NSW 2141

Deformability of Rock Materials in Uniaxial Compression

Client	Tetra Tech Coffey	**Sample Source**	BH03_17.16-17.39
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105949-MOD
Job #	S25228-1	**Sample #**	S105949

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	28/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Average Specimen Diameter (mm)	51.5	**Moisture Content (%)**	7.1
Average Specimen Height (mm)	143.4	**Wet Density (t/m^3)**	2.37
Length to Diameter Ratio	2.8	**Dry Density (t/m^3)**	2.21
Duration of Test (min)	10.88	**Rate of Displacement (mm/min):**	< 0.1
Date of Test:	21/5/25	**Specimen Curing**	-
Mode of Failure	Single shear plane	**Test Apparatus**	Matest Compression Machine with Axial and Circumferential Extensometers.

Before Test

After Test

Uniaxial Compressive Strength **41** **MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	19 GPa	0.11	from 57 % to 69 % of Max UCS
Secant	13 GPa	0.10	from 0 % to 63 % of Max UCS

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Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 27/05/2025

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Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Tetra Tech Coffey	**Sample Source**	BH03_22.6-22.84
Address	Level 20, Tower B, Citadel Tower, 799 Pacific Highway Chatswood	**Sample Description**	Sandstone
Project	St George Private Hospital - SYDGE381816	**Report #**	S105950-UCS
Job #	S25228-1	**Sample #**	S105950

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	28/05/2025
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 34 MPa

Date Tested:	22/05/2025		Moisture Content:	5.9	%
Specimen Height:	143.4	mm	Duration of Test:	711	seconds
Average Specimen Diameter:	51.8	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Mixed mode				
Other Pertinent Observations:					

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Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 27/05/2025

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

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CERTIFICATE OF ANALYSIS 381145

Client Details

Client	Macquarie Geotech (Sydney)
Attention	D Grover
Address	3 Watt Dr, Bathurst, NSW, 2795

Sample Details

Your Reference	**S25228-1 St George Private Hospital-SYDGE381816**
Number of Samples	5 Soil
Date samples received	20/05/2025
Date completed instructions received	20/05/2025

Analysis Details

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

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

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

Report Details

Date results requested by	27/05/2025
Date of Issue	27/05/2025

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Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		381145-1	381145-2	381145-3	381145-4	381145-5
Your Reference	UNITS	S105937	S105938	S105939	S105940	S105941
Depth		0.3-0.5	1.0-1.3	1.3-1.45	1.0-1.2	1.5-1.95
Sample ID		BH01	BH02	BH02	BH03	BH03
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	21/05/2025	21/05/2025	21/05/2025	21/05/2025	21/05/2025
Date analysed	-	21/05/2025	21/05/2025	21/05/2025	21/05/2025	21/05/2025
pH 1:5 soil:water	pH Units	5.3	6.1	6.3	6.9	7.2
Electrical Conductivity 1:5 soil:water	µS/cm	270	31	14	68	22
Chloride, Cl 1:5 soil:water	mg/kg	160	<10	<10	<10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	260	<10	<10	<10	10

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			21/05/2025	1	21/05/2025	21/05/2025		21/05/2025	[NT]
Date analysed	-			21/05/2025	1	21/05/2025	21/05/2025		21/05/2025	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	5.3	5.3	0	99	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	270	300	11	104	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	160	170	6	97	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	260	270	4	94	[NT]

Result Definitions

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

Quality Control Definitions

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

APPENDIX D: ARCHITECTURAL PLANS

St George Private Hospital

119 Princes Highway Kogarah NSW 2217 Australia

2500814 Consultant Set

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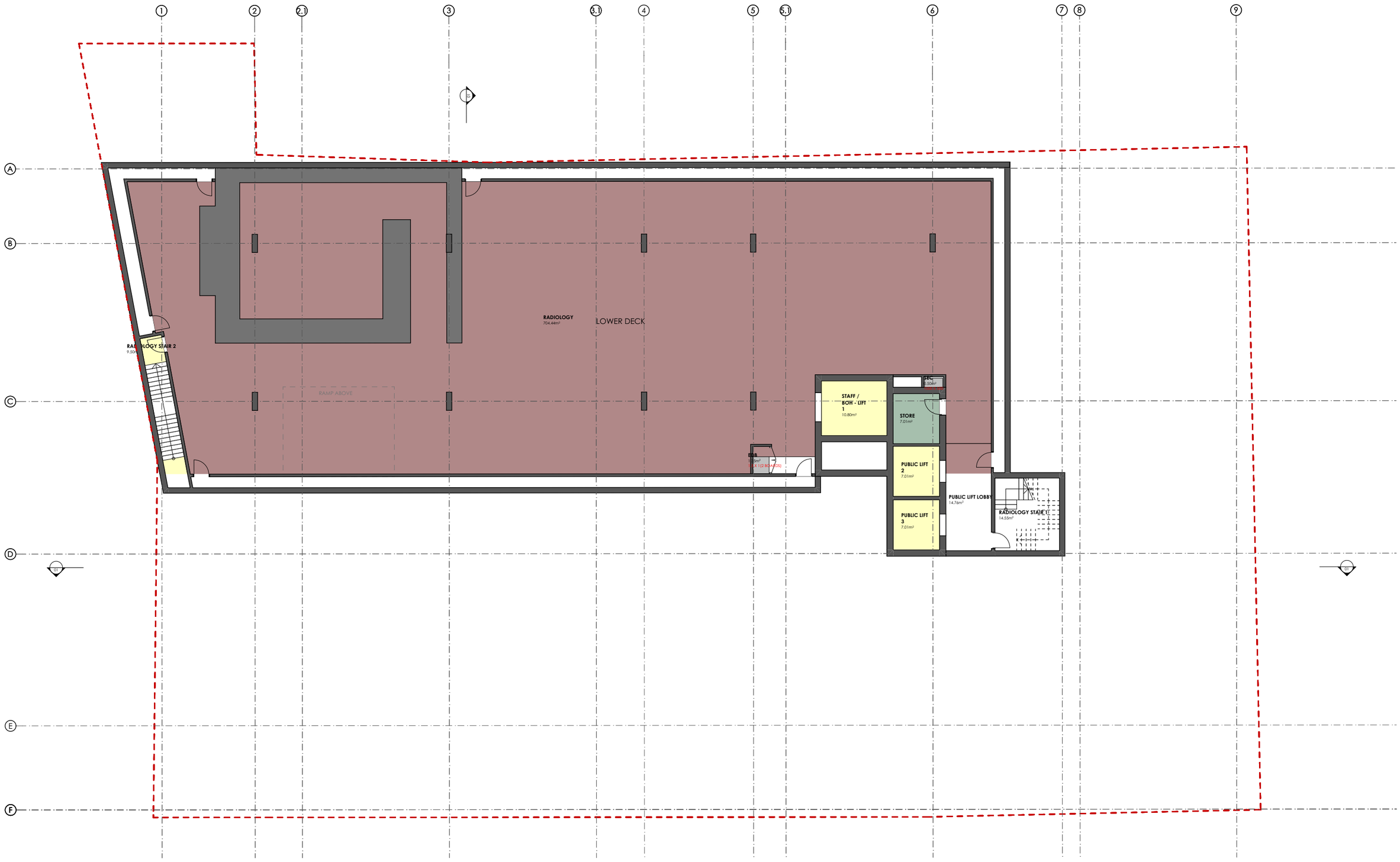
Ramsay Health Care



SK250814 | Newbuild - Basemen 5 Lower Deck - Radiology

1:200 @ A3

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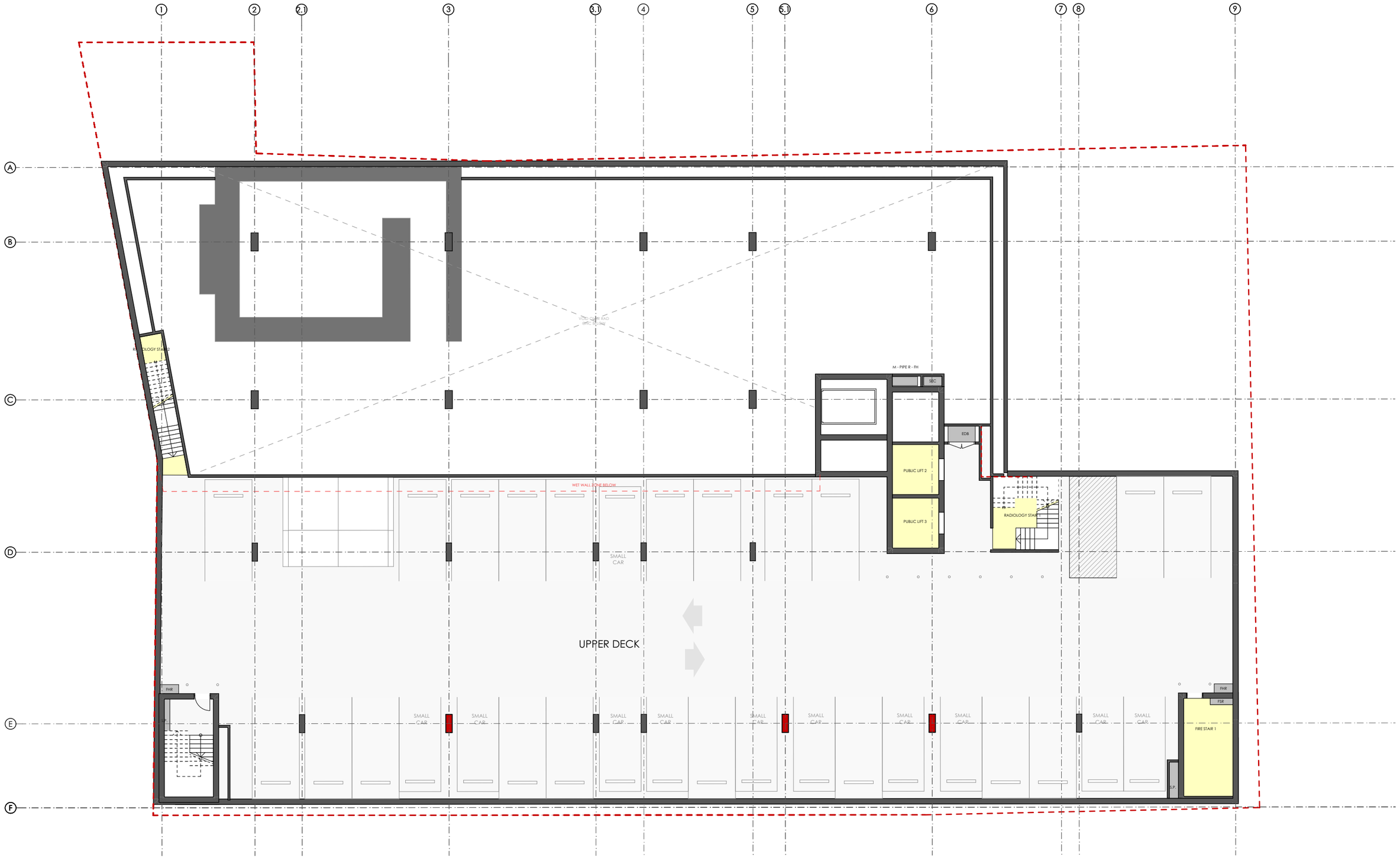
Ramsay Health Care



SK250814 | Newbuild - Basement 5 Upeer Deck

1:200 @ A3

St George Private Hospital |

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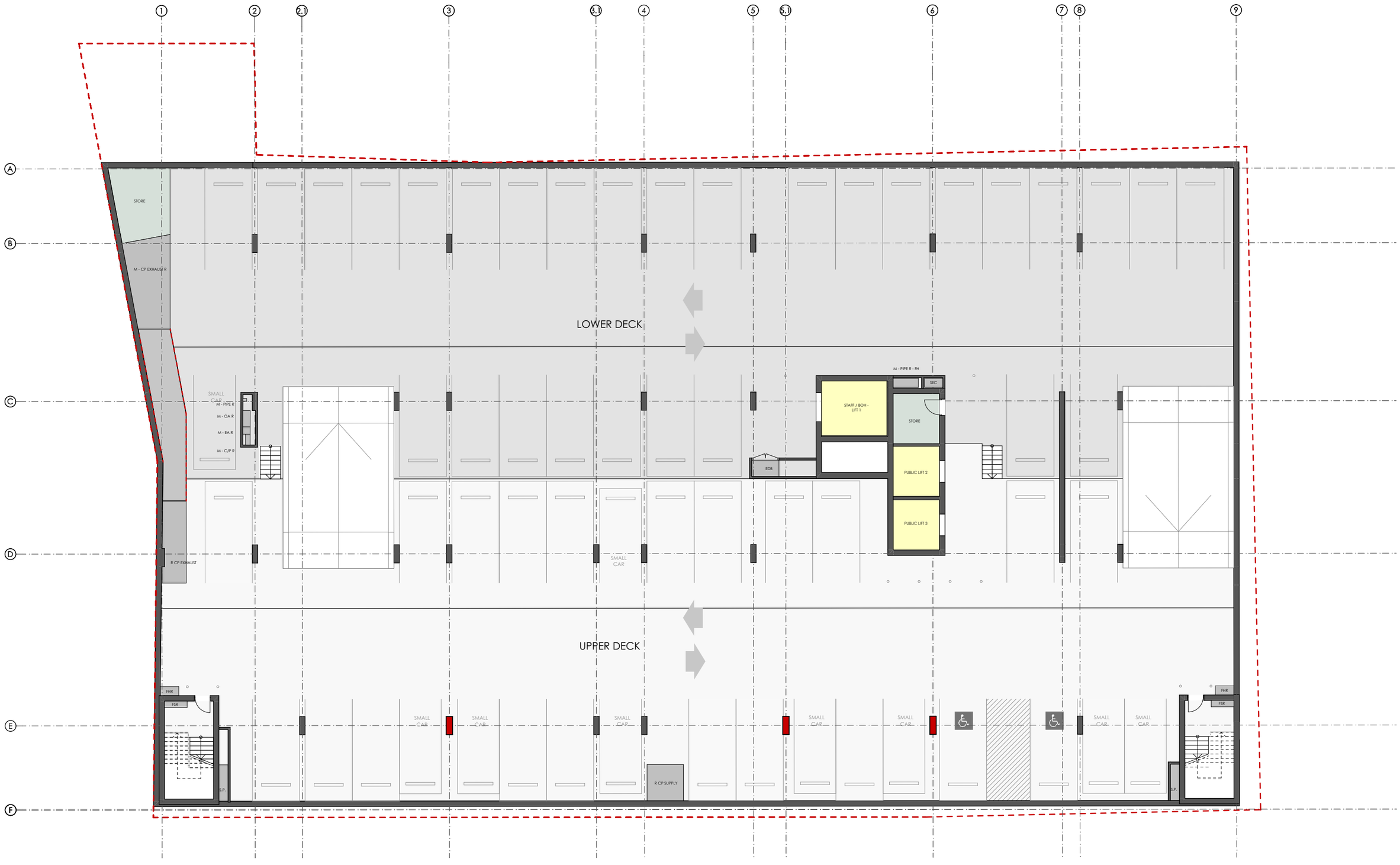
Ramsay Health Care



SK250814 | Newbuild - Basement 4
1:200 @ A3

St George Private Hospital |

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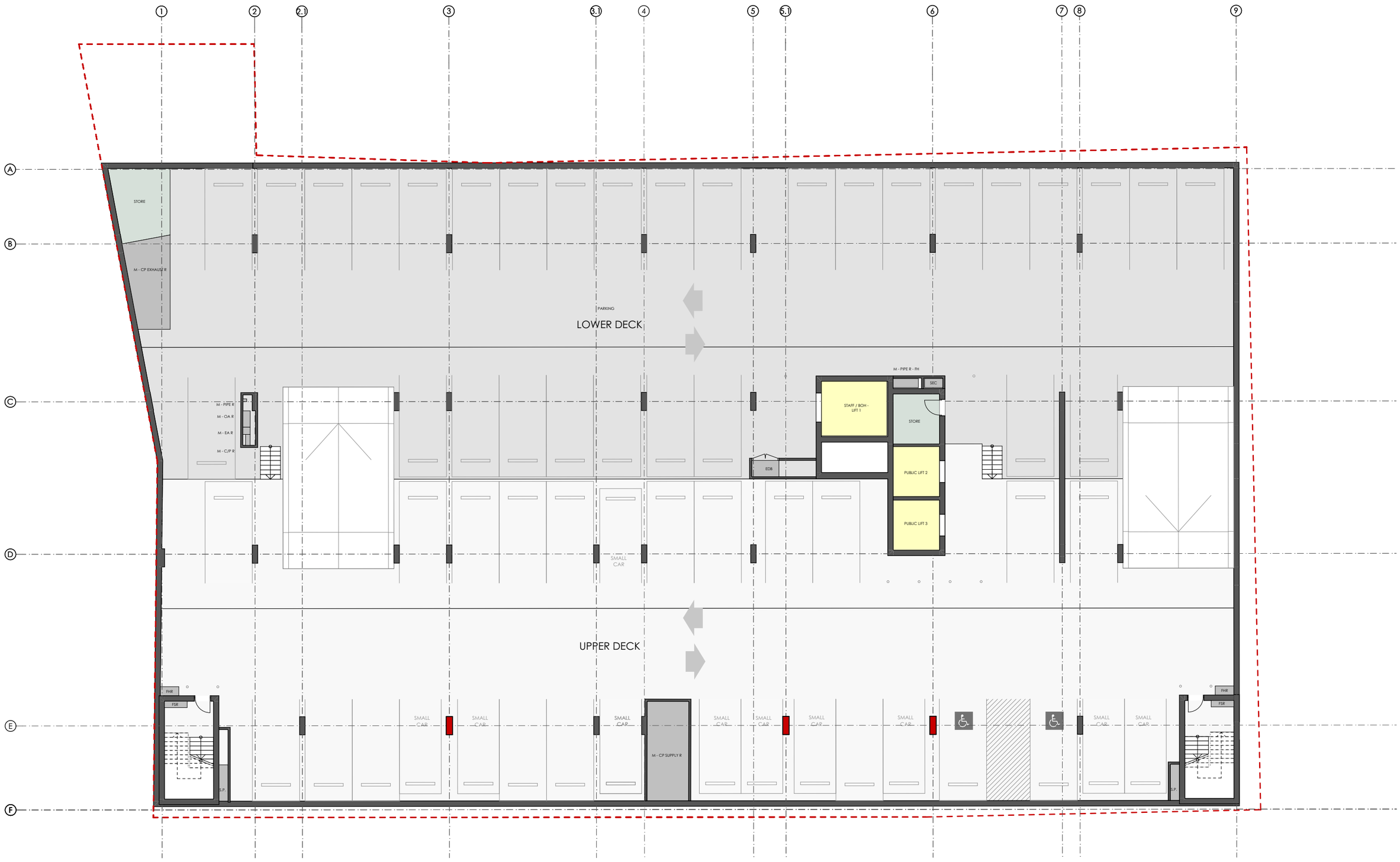
Ramsay Health Care



SK250814 | Newbuild - Typical Basement 2-3

1:200 @ A3

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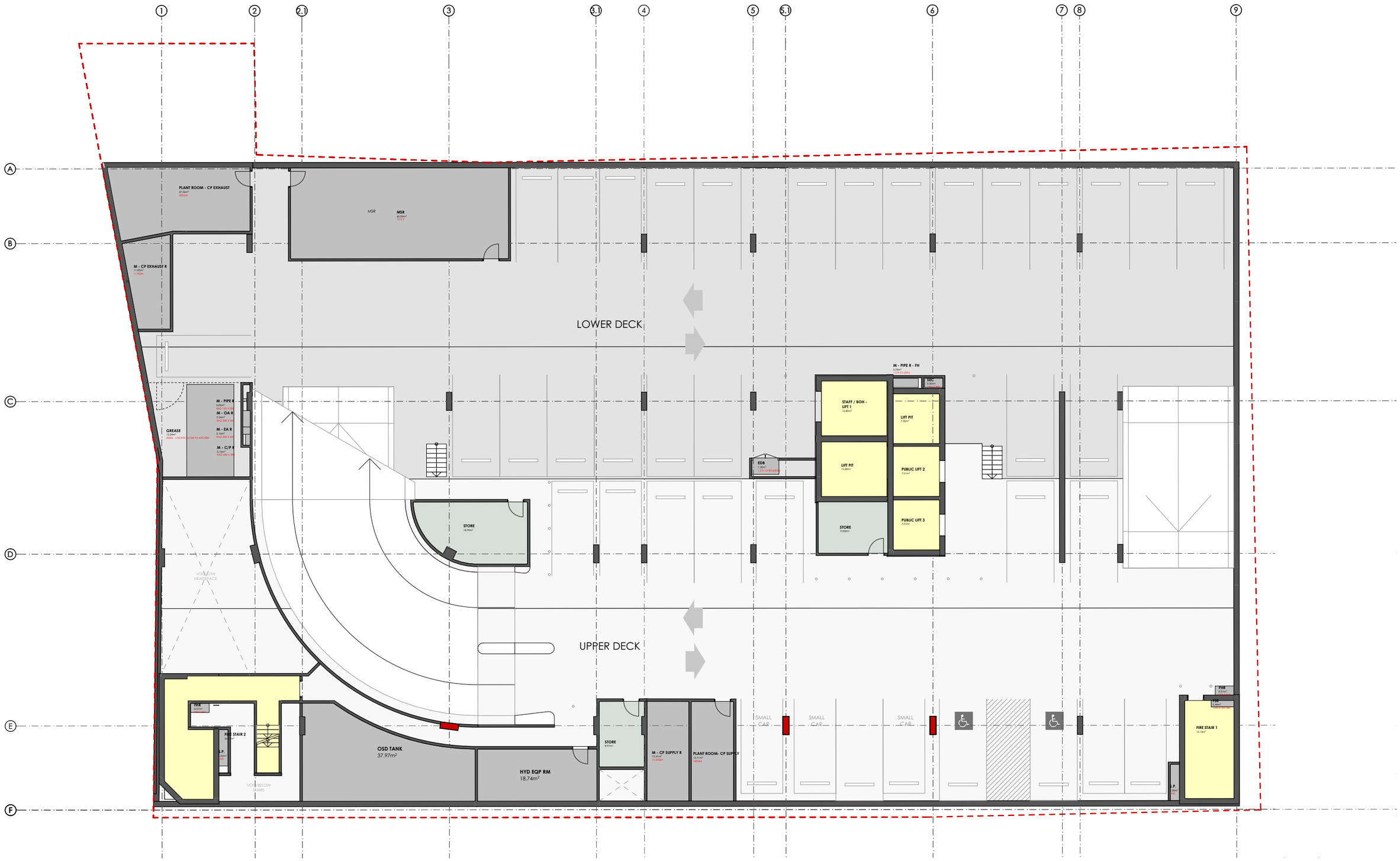
Ramsay Health Care



SK250814 | Newbuild - Basement 1

1:200 @ A3