Douglas PARTNERS

GROUNDED EXPERTISE

Acid Sulfate Soil Management Plan

Proposed Seniors Housing Development

11 Spencer Street, Moruya NSW

Prepared for Illawarra Retirement Trust

Project 211446.03

19 December 2025

Douglas Partners Pty Ltd
ABN 75 053 980 117
douglaspartners.com.au
1/1 Luso Drive, Unanderra, NSW 2526
(02) 4271 1836

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

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Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

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1. Introduction

Douglas Partners Pty Ltd (Douglas) has been engaged by Artazan Property Group (APG) on behalf of Illawarra Retirement Trust (IRT) to prepare this acid sulfate soil management plan (ASSMP) for the proposed seniors housing development located at 11 Spencer Street, Moruya NSW (hereinafter referred to as 'the site'). The site is shown on Drawing 1, Appendix A. The ASSMP was prepared in accordance with Douglas' email proposal dated 15 October 2025.

The proposed development is subject to a state significant development application (SSDA) and associated Secretary's Environmental Assessment Requirements (SEARs), which includes the requirement to prepare an ASSMP (as required).

The objective of this ASSMP is to provide management methods and procedures to minimise environmental impacts resulting from the disturbance of acid sulfate soils (ASS) during the construction of the proposed development. This ASSMP provides a summary of previous ASS test results, neutralisation and treatment methods, verification testing and monitoring requirements, emergency response procedures and leachate management procedures and contingency measures.

This ASSMP is devised on the basis of the guidelines and reference documents endorsed by NSW EPA and with reference to other national guidelines where considered appropriate and includes the following key guidelines:

- Acid Sulfate Soil Management Advisory Committee (ASSMAC), *Acid Sulfate Soil Manual 1998* (Stone, Ahern, & Blunden, 1998).
- QLD Department of Resources, QLD Department of Environment and Science, A*cid Sulfate Soil Technical Manual: Soil Management Guidelines, Version 5.1* (Dear, et al., 2024).
- Department of Agriculture and Water Resources (DAWR), *National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual* (Sullivan, et al, 2018a).
- DAWR, *National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual* (Sullivan, et al, 2018b).

This report must be read in conjunction with all appendices, including the notes provided in Appendix B.

2. Site information and environmental setting

Site address	11 Spencer Street, Moruya NSW
Legal description	Lot 11 Deposited Plan 1008755
Area	18.3 ha
Zoning	Zone R3 Medium Density Residential (northern portion) Zone R2 Low Density Residential (remainder of site)
Local Council area	Eurobodalla Shire Council
Current use	Rural residential
Surrounding uses	North – Spencer Street, then Moruya Cemetery and residential beyond East – Francis Street, then agricultural (grazing) and rural residential beyond South – rural residential West – Dwyers Creek Road then agricultural (grazing) and rural residential beyond
Topography	The surrounding area comprises undulating hills that generally fall northward toward the Moruya River. Within the site, surface levels predominantly grade in a northerly direction and toward an undefined drainage channel in the northeastern corner of the site, and to the west toward a tributary of Racecourse Creek in the western part of the site. Typical slopes range from 1 in 8 to 1 in 20, with locally steeper gradients adjacent to drainage depressions in the western and northeastern portions. A shallow north–south trending ridgeline traverses the eastern part of the site, forming the highest ground and falling toward adjacent drainage features. West of the creek in the southwestern portion of the site, the topography includes a localised low-lying area. Overall relief across the site is approximately 20 m, with the highest elevation of about 30 m AHD near the southern boundary and the lowest point of approximately 10 m AHD along the western boundary.
Geology	NSW Seamless Geology (GSNSW, 2023) mapping indicates that most of the site is underlain by Moruya Tonalite of Devonian Age which generally comprises foliated (flattened xenoliths) fine grained tonalite and medium grained granodiorite (Dmom). The mapping also indicates an area in the western portion of the site (along the western drainage depression) is underlain by Quaternary Age alluvial valley deposits which generally comprises silt, clay and fluvially deposited lithic to quartz-lithic sand and gravel (Q_av).
Groundwater	Based on the findings of the recent preliminary hydrogeological investigation (refer to Section 5), groundwater was intersected during drilling at Bores 2, 3, 4 and 46 at depths ranging between 0.1 m – 4 m below ground level (m bgl). Ground water monitoring wells were installed in Bore 45 (north western part of the site), Bore 46 (northeastern part of site) and Bore 47 (central southern part of the site). Following well development, groundwater levels were recorded between 1.0 m and 1.5 m bgl in Bore 46 and between 5 m and 7 m bgl in Bores 45 and 47. Groundwater flows are expected to follow the surface topography toward an undefined drainage channel in the northeastern corner of the site, and to the west toward a tributary of Racecourse Creek.

Surface water	Two unnamed creeks / drainage depressions are located on site (refer to blue lines on Figure 1). An earth embankment dam is also located near the eastern site boundary. The north-eastern drainage depression appears to be commonly dry and drains excess water from an off-site farm dam located approximately 100 m east of the site. This drainage depression discharges water into Racecourse Creek, approximately 820 m to the north of the site. The western drainage depression appears to be a more substantial watercourse flowing in a north-westerly direction across the site, prior to discharging into Racecourse Creek, approximately 90 m west of the site. Racecourse Creek discharges into the Moruya River, approximately 2.8 km north-east of the site.
Acid sulfate soil risk	Reference to the NSW Department of Environment and Climate Change Acid Sulfate Soil Risk Map (NSW DECC, 2008) indicates the site is not located in an area with known occurrences of acid sulfate soils. The site is located approximately 600 m south of an area mapped as having a "*low probability of occurrence*".

The site boundary is shown on Figure 1.

Figure 1: Site boundary (red) and layout

3. Background on acid sulfate soils and risk categories

ASS are naturally occurring sediments that contain reduced inorganic sulfur (RIS), including iron sulfides, (primarily pyrite), commonly deposited in estuarine environments.

Further details on the formation of ASS is in Appendix C and the relevant guidelines cited in Section 1. ASS can either be classified as 'actual acid sulfate soils' (AASS) which are soils that have already reacted with oxygen to produce acid, or 'potential acid sulfate soils' (PASS) and are often found in the same soil profile, with AASS overlying PASS. PASS are soils containing iron sulfide that have not been exposed to oxygen (e.g. soils below the water table). PASS therefore have not produced sulfuric acid but have the potential to do so if exposure to oxygen occurs.

ASS field and laboratory-based criteria for assessing whether soils are classified as PASS / AASS and/or, exceed the action criteria for management if disturbed, are provided in Appendix C.

Dear, et al. (2024) relates environmental risk from ASS to the treatment level and volume of disturbance of ASS. Based on the tonnage of ASS to be disturbed and the average net acidity, the proposed disturbance of the site soils is categorised as one of the following:

- Low level of treatment: Category L;
- Medium level of treatment: Category M;
- High level of treatment: Category H;
- Very High level of treatment: Category VH; and
- Extra High level of treatment: Category XH.

It is noted that where disturbance involves groundwater dewatering, or if the site is close to an environmentally sensitive area (ie, tributary of Racecourse Creek) / acidophilic ecosystem, then further consideration of the potential impact should be undertaken and if significant Dear, et al. (2024) indicates the disturbance may need to be treated as per Category XH and an EM Plan (ASSMP) prepared.

The assessment of risk categorisation for this ASSMP is provided in Section 7.2.

4. Review of relevant previous investigations

Douglas has previous carried out the following investigations relevant to assessment of ASS at the site, which were undertaken concurrently:

- Douglas *Report on Desktop Geotechnical Assessment, Proposed Seniors Housing Development, 11 Spencer Street, Moruya* NSW, Report 211446.02.R.001.Rev1 dated 3 December 2025 (Douglas, 2025a);
- Douglas *Report on Detailed Site Investigation (Contamination), Proposed Seniors Housing Development, Spencer Street, Moruya* NSW, Report 211446.02.R.002.Rev1 dated 3 December 2025 (Douglas, 2025b);

Douglas previously conducted an ASS investigation for the site as part of Douglas (2025b) to determine site conditions and to assess the presence / depth of ASS.

The investigation included the drilling of 47 boreholes to depths of up to 10 m, installation of three groundwater monitoring wells to assess groundwater depths and groundwater quality, analysis of selected soil samples for ASS (field) screening tests and detailed soil laboratory testing for net acidity (acid base accounting).

Based on the findings of the previous investigations, the following comments are provided with respect to acid sulfate potential at the site.

- Reference to web-based mapping indicates that the site is located in an area mapped as '*no known occurrences of acid sulfate soil materials*';
- Alluvial soils were only encountered in Bores 1 to 6 which where were positioned along the drainage depression in the western part of the site (tributary of Racecourse Creek).
- Field pH screening using the initial screening test for pH in H_2O (pH_F) and oxidised field pH (pH_{FOX}), following addition of H_2O_2, were undertaken on 15 soil samples collected from Bores 1 to 6.
- Results of pH_F were all > 6 (in the range of 6.3 – 7.0), which typically indicates that Actual Acid Sulfate Soils (AASS) are not present at the locations and depths sampled. This interpretation is based on the ASSMAC/QASSIT guidelines which suggest that oxidation of pyrite has occurred in the past when pH_F is less than 4.
- Results for pH_{FOX} ranged between 4.0 and 6.3 (i.e. pH_{FOX} > 3) with low to medium reaction rates recorded. No samples indicated pH_{FOX} values of less than 3 which would provide conclusive indications of PASS at the screening stage. However, a number of samples showed pH drops of greater than 1 pH unit and one sample was reported with a final pH values of 4, both of which could indicate the possible presence of PASS. Accordingly, selected samples were tested using the Chromium Suite method.
- Detailed acid sulfate testing of two samples (3/0.5 – 0.6 and 4/0.3 – 0.4) using Chromium suite methods at a NATA accredited laboratory
- Sample 3/0.5 – 0.6 is a silt clay and had a net acidity of 0.023 %S which is less than the action criteria (0.06 %S if 1 – 1000 tonnes of ASS is disturbed or 0.03 %S if > 1000 tonnes of ASS is disturbed).
- However, sample 4/0.3 – 0.4, which is a sandy silt, had a net acidity of 0.061 %S which is greater than the associated action criterion (0.03 %S if 1 – 1000 tonnes or > 1000 tonnes of ASS is disturbed). The chromium reducible sulfur (SCr) result (0.04 %S) for this sample was ≥ 0.001 %S indicating the presence of sulfidic soils and, therefore, the presence of PASS.
- Testing of soils confirmed the presence of ASS within the drainage depression in the western part of the site (tributary of Racecourse Creek) only, triggering the need for management under this ASSMP.
- Management in accordance with an ASSMP is required, if the alluvial soils along the drainage depression in the western part of the site are disturbed as part of the proposed development.

The action criteria adopted for previous investigation and this ASSMP for determination of the presence of PASS / AASS are provided in Appendix C.

5. Proposed development

Based on the provided Proposed Overall Site Plan prepared by Breathe Architects Pty Ltd (DA28.00 dated 10 October 2025) and with reference to IRT – Morya Draft Masterplan, June 2025, and other provided plans, the proposed development of the site includes:

- Single storey retirement living villas;
- Two-storey potential manor homes independent living units and key worker accommodation;
- Three and four storey retirement living apartments with sub-grade undercroft parking (Buildings A to H);
- Residential aged care and specialised care suites;
- Service and community infrastructure, associated public domain facilities, open space, riparian corridors and associated infrastructure.

Detailed design is yet to commence. As such, it is unknown if excavation within or immediately adjacent to the drainage depression in the western part of the site (tributary of Racecourse Creek) will be required.

It is anticipated that if required, only minor excavation works will be undertaken within or immediately adjacent to the drainage depression and likely associate with landscaping, pedestrian footpath and bridge construction and installations of stormwater infrastructure.

Based on the project masterplan, it is anticipated that basement excavation of depths up to 3 m are likely required for the sub-grade undercroft car parking proposed for each of the three-storey retirement living apartments (Buildings A to H). It is noted that these excavations are in parts of the site where only residual soils have been encountered (i.e. not in an area affected by ASS).

6. Data gap assessment

Based on previous investigation findings and subject to detailed design including excavation works within or adjacent to the drainage line in the western part of the site, additional subsurface investigation may be required prior to construction to provide:

- Additional test locations to confirm the extent of ASS within and immediately adjacent to the drainage line which may be disturbed by the development;
- Delineation of the lateral and vertical extent of ASS;
- Confirmation of the lime treatment rates for each soil unit / depth; and
- Optimise the treatment and management strategy.

The scope of the data gap assessment includes:

- Measurement of the pH and electrical conductivity (EC) of the Racecourse Creek tributary located in the western portion of the site using a handheld calibrated meter;
- Drilling of four boreholes to a depth of 4 m below ground level using a track-mounted mini-excavator and logging of the subsurface conditions. The proposed test locations will target

areas of excavation once detailed design is available, but likely to be two either side of the creek as step outs to the exiting data points;

- Collection of soil samples at every 0.25 m depth interval and at least one sample for every change in strata observed;
- ASS (field) screening testing of all alluvial or fill soil samples and net acidity (acid base accounting) testing of up to 32 soil samples
- Analysis of surface water samples for pH, EC, major cations and anions, dissolved and total metals (including Al and Fe); and
- Preparation of a data gap assessment report and if required the revision of this ASSMP.

7. Potential for oxidising acid sulfate soil and risk categorisation

7.1 Acid sulfate soil oxidation potential

Based on the current planning stage of the development, it is unknown if excavation within or immediately adjacent to the drainage depression in the western part of the site (tributary of Racecourse Creek) will be required.

However, it is anticipated that only minor excavation works within or immediately adjacent to the drainage depression will be required. As such, the volume of ASS likely to be disturbed by the development is presumed to be less than 1,000 tonnes.

ASS may also be exposed during dewatering, where required (i.e. if excavation beneath the groundwater table and subsequent dewatering of ASS is required).

Based on the results of previous investigations (refer to Section 4), any excavations which disturb or uncover natural alluvial soils from low lying areas located within the western part of the site may have the potential to oxidise PASS and/or disturb AASS.

Any disturbance (e.g. excavation or dewatering) of ASS must be undertaken in accordance with this ASSMP.

7.2 Assigned risk categorisation

The risk categorisation and formulating this ASS management strategy considers:

- Proximity to the adjacent tributary of Racecourse Creek and associated ecosystem; and
- Previous ASS results and soil types.

Dear, et al. (2024) relates environmental risk from ASS to the treatment level and volume of disturbance of ASS. Based on the proposed development and subsequent tonnage of ASS to be disturbed (estimated to be <1,000 tonnes as per Section 7.1) and the maximum net acidity (0.061 %w/w S as per Section 5), the proposed disturbance of the site soils is considered to be:

- High level of Treatment (H)

8. Acid sulfate soil management

8.1 Roles and responsibilities

The following key roles and responsibilities are relevant to this ASSMP:

- Contractor: the contractor with responsibility to implement this ASSMP during earthworks / dewatering etc;
- Site Supervisor: head representative for the Contractor responsible for the day-to-day site operations including management of ASS; and
- Environmental Consultant: data collection / verification testing and documentation of the works, as per this ASSMP.

8.2 Management options

Stone, Ahern, & Blunden (1998) and Dear, et al. (2024) provides the following potential soil management options:

Option 1	Non-excavation or minimal earthworks (avoidance);
Option 2	On-site treatment (neutralisation) followed by: Off-site disposal; and/or On-site reuse.
Option 3	Off-site treatment and disposal.
Option 4	On-site reburial below the permanent water table without treatment (PASS only).
Option 5	Off-site reburial below the permanent water table without treatment (PASS only).
Option 6	Hydraulic separation of ASS fines.

Based on the proposed development and with consideration to sustainable design the best case scenario is presumed to be Option 1 – non-excavation (avoidance). However, given that ASS may be present in localised pockets within the riparian corridor (ie, not site wide), limited disturbance is expected. Therefore, Option 2 – on-site treatment followed by off-site disposal (and/or on-site reuse) has been identified as the preferred management option, with reference to the relevant guidelines and reference materials.

It is the responsibility of the Contractor to manage ASS under this ASSMP and in accordance with relevant standards and statutory requirements. Verification sampling and testing must be undertaken by the Environmental Consultant.

8.3 Proposed management strategy for on-site treatment

8.3.1 General

The process for treatment of excavated ASS comprises:

- Preparation of a treatment pad as described in Section 8.3.2;
- Excavation and segregation / stockpiling and treatment of ASS:
  - For coarse soils (i.e. sands), treatment should occur within approximately 12 to 18 hours (or less) following excavation;
  - For fine-grained soils (i.e. clays), treatment should occur within approximately 40 to 60 hours following excavation. Faster oxidation rates are possible, particularly in warm weather;
- Treatment via spreading the ASS over the guard layer in layers of up to 0.3 m thick, leaving a 1 m buffer between the toe of the spread soil and the containment bund or drain. When spreading the first soil layer, care should be taken not to churn up the guard layer;
- Application of aglime over the 0.3 m layer at the minimum lime dosing rate (refer to Section 8.3.3) and harrow / mix thoroughly. Use of rotary plough equipment (e.g. auger bucket) may be appropriate for cohesive soils, where adequate mixing is difficult to achieve. If ASS materials are too wet, adequate mixing of aglime cannot be achieved and soils may require a period of drying prior to mixing;
- Undertaking verification testing (as outlined in Section 10) to confirm that the ASS has been adequately neutralised in each layer prior to placement of the next layer to be treated. If verification testing indicates that additional neutralisation is required, add additional aglime (at an appropriate liming rate) and mix as described above;
- Continuing the spreading/ liming / harrowing / verification cycle for each 0.3 m layer until excavation is finished;
- Verification testing to confirm that the ASS has been adequately neutralised. Upon confirmation, the soil should be removed from the treatment pad for beneficial re-use on site and/or or off-site disposal and/or re-use (subject to waste classification and specific Resource Recovery Exemption);
- Management of leachate and groundwater may also be required where leachate is produced and/or if groundwater is impacted by the works as outlined in Section 9; and
- Adding a layer of fine aglime at the base of excavations in ASS (5 kg/m^3 is recommended) to neutralise downward seepage from exposed ASS, or to minimise acidification of groundwater following re-establishment of groundwater levels.

8.3.2 Preparation of treatment pads

The treatment pad should be located as far as practical from any ecological receptors (e.g. drainage lines which enter the stormwater system and nearby water bodies. The pad should be of an appropriate area to accommodate the volume of soil to be treated / stored and should be prepared on relatively level or gently sloping ground to minimise the risk of potential instability issues, with a fall to the local drainage sump.

Construction of the treatment pad involves:

- Lining the footprint of the pad with either:
  - Natural low permeability clay;
  - A compacted clay layer;
  - Geosynthetic liner (e.g. HDPE);
  - Impervious barrier (e.g. concrete or bitumen hardstand);
- Placement of a guard layer of fine aglime at approximately 5 kg/m^2 per 300 mm layer of ASS proposed. The guard layer should be re-applied each time treated soils are removed, prior to placement of the next batch of un-treated ASS; and
- Construction of a perimeter clay bund (or equivalent) to collect any leachate runoff and to prevent surface water from entering the treatment pad. The inner bund slopes should be lined to prevent leachate seeping into the ground surface and sized to prevent overflow of untreated leachate onto the site.

A standard treatment pad is shown on in Figure 2, below.

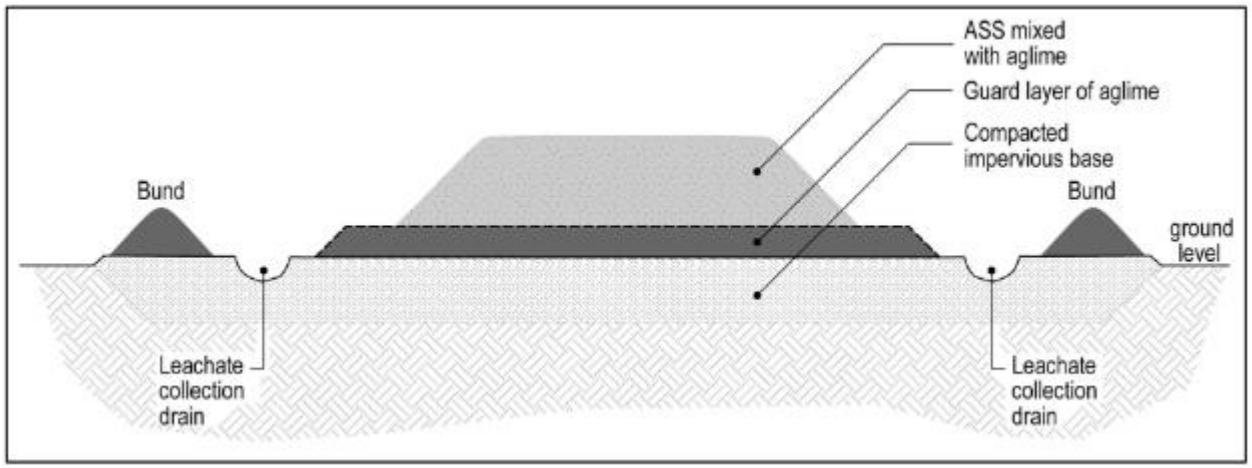


Figure 2: Schematic cross-section of a treatment pad, including compacted impervious base (clay layer), guard layer, leachate collection drains and bunding (source: Dear, et al. (2024))

Reapplication of the guard layer will be necessary under treatment pads if the treated soil is being removed as the guard layer could be removed with the treated soil. Guard layers may need to be applied between each placed ASS layer in situations where multiple layers of ASS are placed on the same treatment pad.

8.3.3 Neutralising materials and liming rate

Agricultural lime (aglime) is the preferred neutralisation material.

Refer to Appendix D for additional information on aglime and purity of specific aglime.

Based on the assessment results, fill / natural soils that are to be disturbed during excavation are to be treated using aglime prior to reuse off-site or on-site or disposal. Table 1 provides indicative liming rates for neutralisation of the ASS likely to be disturbed.

Table 1: Indicative liming rate for soil

Material description	Net Acidity (%S) max. [a](range) [c]	Aglime application rate [b] (kg/tonne)
Natural Alluvial Soils: Generally low plasticity, dark brown grey clayey to sandy silt, silty to sandy clay and sand (encountered in Boreholes 1 to 6) to a maximum depth of 1.1 m	0.06 (0.023-0.061)	3 kg/tonne (4.5 kg/m^3)

Notes:
a Maximum net acidity for soil unit/type. Net acidity to be calculated based on the equation provided in Appendix C.
b Lime application rate calculated using maximum net acidity for soil unit / type using the equation in Appendix D. Lime rate calculated based on an ENV of 95% for aglime, a factor of safety (FOS) of 1.5 and a bulk density of 1.5 t/m^3 for clay / silt.
c Net acidity range for soil unit/type

Depending upon the source of the aglime and ultimately the representative effective neutralising value (ENV) of the aglime selected, the minimum lime dosing rate may be increased or decreased. Prior to the commencement of works, the minimum lime dosing rate should be finalised following review of the ENV of the selected aglime.

8.3.4 Trenching works

For trenching works (i.e. service installation) which cannot be rerouted or modified to ensure the invert depth of the trench is above ASS and where trenchless tunnelling technologies cannot be used to minimise disturbance, the following process is recommended with reference to Dear, et al., (2024), for excavated trench spoil:

- Non-ASS surface soils should be removed and segregated from ASS. Soil horizons should be replaced back in the trench in the same order they were removed (after ASS has been neutralised), and subject to geotechnical considerations;
- The trench excavation should be staged, such that ASS soils are excavated, treated and backfilled within 24 hrs (typically within an 8-hour working day);
- Where the ASS risk assessment shows the risk is high (refer to Section 7.2), the trench is located in a sensitive environment and/or where dewatering is required, ASS should be removed from the trench and neutralised on a fully contained treatment pad (refer to above) and neutralisation performance criteria (refer to Section 10);
- Where the ASS risk assessment shows the risk is not high, the trench is not located in a sensitive environment and no dewatering is required the following management strategy could be adopted in lieu of a treatment pad:
    - A guard layer of aglime (refer to above for application rates) should be applied to the ground surface alongside the trench;
    - Excavated soil from the trench should be placed on the guard layer;
    - Aglime should be applied to the surface of the excavated soil at double (FOS of three) the application rate provided in Section 8.3.3. Verification testing is not required for this methodology;
    - A layer of aglime should be placed over the base of the excavation. A lime application rate of 5 kg/m^2 is recommended;
    - The excavated treated soil should be backfilled into the trench; and

- Segregated non-ASS overlying ASS should be re-instated on top of the treated ASS, minimising any aglime at the ground surface.

8.4 Alternative strategy or contingency plan

Where the proposed primary management option is not possible, or practical, alternate or contingency strategies, with reference to the applicable guidelines, may be considered and following a 'fit for purpose' assessment. These contingency options are outlined in Appendix E.

9. Leachate and groundwater management

Potential leachate and groundwater management strategies are provided in Appendix F.

10. Verification testing of treated soils and water

Verification testing to assess whether ASS has been adequately neutralised will be undertaken by means of:

- Screening tests (pH_F and pH_{FOX}) at the frequencies in Table 2; and
- Acid base accounting (e.g. using the chromium suite) testing at the frequencies in Table 2.

Based on a 'Category H' treatment level, verification testing of the ASS and leachate (if present) is required after the addition of lime to test whether the soil / water has been adequately neutralised, whether or not adequate mixing of the ASS has been achieved, and to reduce the risk of acidic water being returned to the environment (including watercourses). The verification testing frequency for ASS is in Table 2.

Table 2: Verification testing frequency for treated acid sulfate soils

Test	Frequency
Field test: pH_F and pH_{Fox} screening	One sample / soil type AND One sample / 25 m^3 -100 m^3 of treated soil (whichever is the greater frequency) AND At least three to six samples / 200 mm to 300 mm deep soil treatment layer
Net acidity (acid base accounting)	One sample / soil type AND Volumes of <250 m^3 = two samples

Note:
Verification testing frequencies should be adjusted (either increased or decreased) depending on net acidity value, performance, material quantities and purpose/reuse, and may be subject to change by the appropriate regulatory authority in the event of a review.
Laboratory analysis on untreated soils for each treatment layer should be considered where heterogenous materials are present and initial ASS investigations indicate the presence of existing ANC (unverified).

In addition, the pH of all ponded leachate around the confines of the treatment bunds and adjacent surface waters should be measured on a regular basis and results assessed against the criteria provided in Table 3 and against background (pre-construction) levels. The soil and water contained within the bunded treatment area should not be removed until the target values in

Table 3, below, have been achieved. Treatment of deeper soil layers should not be commenced until the existing surface layer has been validated and removed.

Table 3: Target levels of neutralised soil and water

Test	Component	Target level
Monitoring of water (leachate, surface water and groundwater)	pH	pH 6.5 < pH < 8.5, or one pH unit from background levels
	Turbidity	To comply with either values determined in consultation with the Authority or less than local background levels (baseline monitoring required).
	Aluminium (Al) and iron (Fe)	Establish local water quality data prior to site disturbance for comparison.
	Dissolved oxygen (DO)	To comply with either values determined in consultation with the Authority or less than local background levels established by baseline monitoring.
	Electrical conductivity (EC)	To comply with either values determined in consultation with the Authority or less than local background levels established by baseline monitoring.
Field screening of soil [a]	pH_F	$6.5 \leq pH_F \leq 8.5$
	pH_{FOX}	$6.5 \leq pH_{FOX} \leq 8.5$
Acid base accounting (including chromium reducible sulfur (Scr) method)	Net acidity [b]	Zero or negative
	pH_{KCL}	$6.5 \leq pH_{KCL} \leq 10$

Notes:
a used as a guide only to assess when adequate neutralisation and soil mixing has been achieved.
b determined using the equation in Appendix C

It should be noted that laboratory tests will require at least four days turnaround, possibly longer, and hence sufficient time should be allowed in the treatment program for such verification testing. Only appropriately skilled staff should collect and test verification samples.

11. General monitoring requirements

It is recommended that prior to commencement of works, a construction environmental management plan (CEMP) should be developed by the lead Contractor. The CEMP should also include a program for general site monitoring pertinent to the ASS. A typical monitoring program is provided below and should be implemented by the responsible parties.

Table 4: General monitoring requirements

Task	Frequency	Standard	Reporting/ record keeping	Responsibility
Inception Meeting	Pre-start	ASSMP	Minutes	Contractor / Site Supervisor, Environmental Consultant
Site inspection	Daily	Visual / olfactory signs of ASS	File note	Site Supervisor
Site inspection	Monthly	Visual / olfactory signs of ASS	File Note	Environmental Consultant
Monitoring of disturbed excavations that are in ASS	Daily	Visual until backfilled	File note	Site Supervisor
Monitoring of ASS treatment area/s	Daily	Visual Daily pH testing until results show ASS or leachate has been neutralised (refer Section 10 for criteria and testing requirements)	File note and results of pH testing to be recorded in field sheets	Site Supervisor
Dewatering excavation in ASS	Prior to planned discharge	Treated and tested to demonstrate compliance with ASSMP guidance or regulatory requirements prior to discharge	Field sheets and permit to discharge	Site Supervisor, Environmental Consultant
Surface Waters	Daily (field parameters) Weekly (metals), plus prior to and following discharge	pH, EC, DO, total and dissolved metals (including Al and Fe) tested to demonstrate compliance with ASSMP guidance or regulatory requirements prior to discharge	Field sheets and permit to discharge	Site Supervisor / Environmental Consultant

12. Emergency incident response plan

Construction activities which may cause potential environmental impacts with respect to ASS are summarised in the table below together with recommendations for emergency response procedures.

Table 5: Emergency response procedures

Activity	Environmental threat	Emergency response
Excavations	Flooding of open excavation causing adjacent groundwater levels to rise, leading to potential acid leachate once the excavation is drained.	Inform site foreman and project manager/ environmental officer. Determine pH of groundwater / floodwater in excavation. Correct groundwater / floodwater pH by application of slaked lime (hydrated lime) to bring pH in range of 6.5 to 8.5 or to pre-construction background levels. Drain pit to tanks / ponds for water quality assessment prior to discharge.
Treatment / neutralisation	Soil washes or slips outside of bunded treatment area	Inform site foreman and project manager / environmental officer. Estimate volume of material breaching bund. Conduct pH analysis of adjacent watercourses (if any) and correct pH if potentially impacted. Remove escaped soil into a bunded treatment area. Over-excavate impacted area to 0.2m depth, apply and mix lime at rate as for guard layers (5 kg to 10 kg lime per m2 of surface).
	Breach in containment bund	Inform site foreman and project manager/ environmental officer. Close breach in bund. Conduct pH analysis of adjacent watercourses (if any). Correct pH in any adjacent watercourse (if required).
	Extracted untreated groundwater, surface water or leachate is exiting the site in an uncontrolled manner.	Inform site foreman and project manager / environmental officer. Restrict / stop source of water. Conduct pH analysis of adjacent watercourses (if any).

For all construction activity incidents which pose a potential environmental impact, an incident report must be completed in order that:

- The cause of the incident may be determined;
- Additional control measures may be implemented; and
- Work procedures may be modified to reduce the likelihood of the incident re-occurring.

13. Reporting and record keeping

With reference to Dear, et al. (2024), it is good practice for the Contractor to maintain a record of treatment of ASS. Such records should include the following details:

- Date;

- Location / area / treatment pad;
- Time of excavation;
- Neutralisation process undertaken;
- Lime rate used including;
  - Records which demonstrate a safety factor of 1.5 has been applied in calculating liming rates;
  - Receipts showing quantities of aglime purchased;
  - Evidence of composition, purity, particle size and ENV of the aglime used;
  - Record of aglime use (e.g. per treatment pad, use in guard layers etc);
  - Photographic evidence of incorporation of neutralising agent (aglime).
- Results of monitoring;
- Disposal and/or reuse location; and
- Tonnages and disposal/transfer dockets (if applicable).

A record should also be maintained confirming contingency measures and additional treatment if undertaken. A final report should be issued upon completion of the works presenting the monitoring regime and results and confirming that appropriate management of ASS has occurred during the works.

14. Conclusions and recommendations

This ASSMP provides the ASS management procedures to be enacted to minimise the impact of ASS disturbance on the environment during the proposed works.

If ASS are encountered, then the ASS management procedures provided herein will be enacted to minimise the impact of ASS disturbance on the environment.

15. References

Dear, et al. (2024). *Queensland acid sulfate soil technical manual : soil management guidelines version 5.1.* Dear, S E; Williams, K M; McElnea, A E; Ahern, C R; Dobos, S K; Moore, N G; O'Brien, L E; Department of Environment, Science and Innovation.

Dear, S. E., Williams, K. M., McElnea, A. E., Ahern, C. R., Dobos, S. K., Moore, N. G., & O'Brien, L. E. (2024). *Queensland acid sulfate soil technical manual : soil management guidelines version 5.1.* Department of Environment, Science and Innovation.

GSNSW. (2023). *NSW Seamless Geology*. Geological Survey NSW Web Map Service.

NSW DECC. (2008). *Acid Sulfate Soil Risk Mapping*. NSW Department of Environment and Climate Change.

Stone, Y., Ahern, C. R., & Blunden, B. (1998). *Acid Sulfate Soils Manual.* Wollongbar, NSW, Australia: Acid Sulfate Soil Management Advisory Committee.

Sullivan, et al. (2018a). *National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Identification and Laboratory Methods Manual.* Canberra ACT CC BY 4.0: Sullivan, L; Ward, N; Toppler, N; Lancaster, G, Department of Agriculture and Water Resources.

Sullivan, et al. (2018b). *National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Sampling and Identification Methods Manual.* Canberra ACT CC BY 4.0: Sullivan, L; Ward, N; Toppler, N; Lancaster, G, Department of Agriculture and Water Resources.

16. **Limitations**

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 11 Spencer Street, Moruya NSW in line with Douglas' email proposal dated 15 October 2025 and acceptance received from Danni Mees of APG on behalf of Illawarra Retirement Trust dated 28 October 2025. The work was carried out under a Long Form Consultancy Agreement. This report is provided for the exclusive use of Illawarra Retirement Trust for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

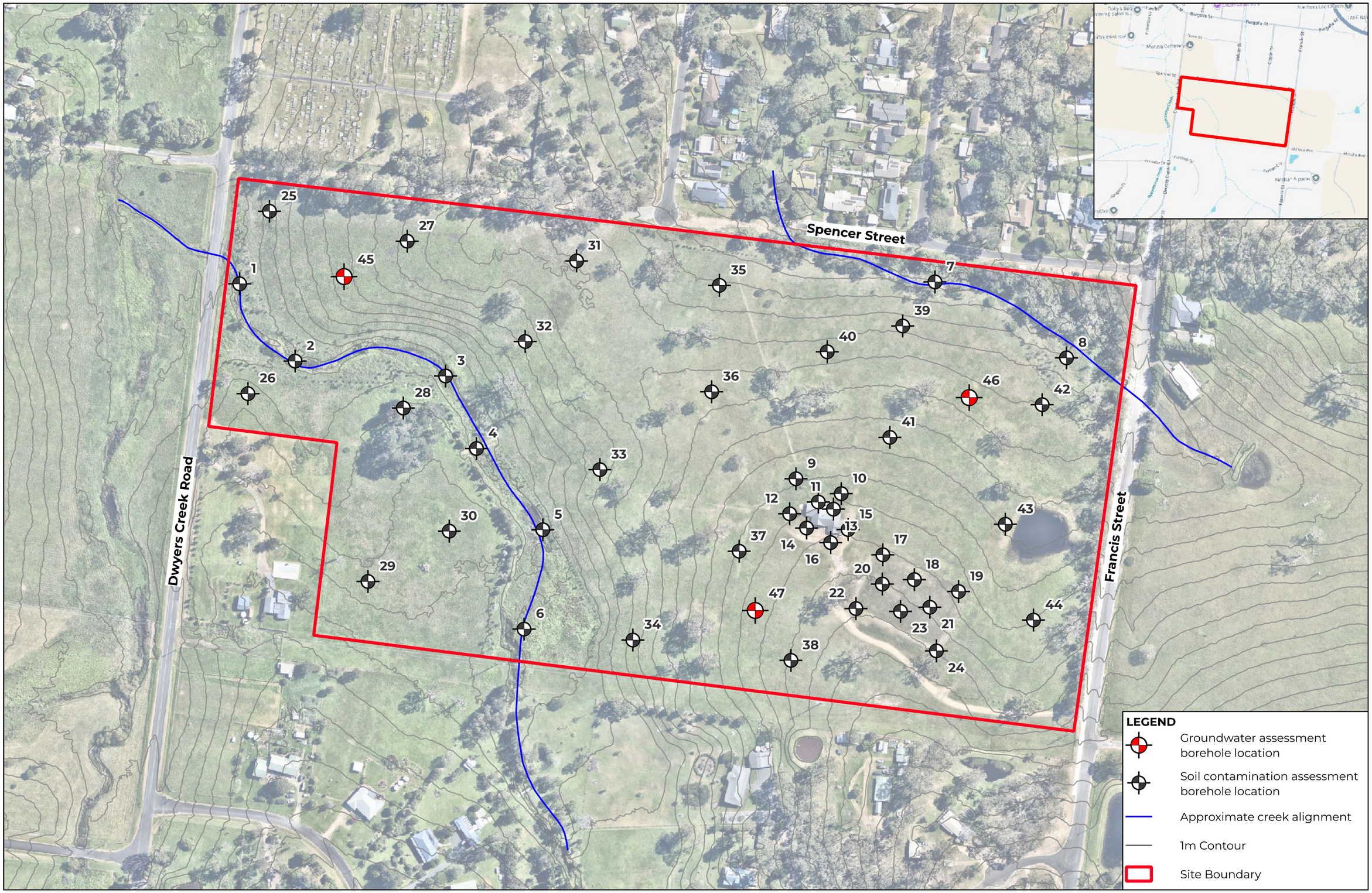
The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed. Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report. This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Appendix A

Drawings



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	211446.02.R.002.Rev0	15.08.2025	ZAK

0 25 50 75 100 125 150 m

1:2500 @ A3

Douglas PARTNERS
OFFICE: Wollongong
1 Luso Drive, Unanderra NSW
(02) 4271 1836

CLIENT: irt

NOTE:
1: Basemap from Nearmap.com (Dated 18.02.2025)

COORDINATE REFERENCE SYSTEM: GDA2020, MGA ZONE 56

PROJECT NAME:
Proposed Residential Aged Care Facility (RACF)

PROJECT ADRESS:
11 Spencer Street, Moruya

DRAWING TITLE:
Borehole Location Plan

PROJECT NO: 211446.02

DRAWING NO: R.002.D.001

REVISION: 0

Appendix B

Notes About this Report

Previous Results

About this Report

October 2024

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

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Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style XW. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when augering in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:

The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to its engineering properties	All other components	All other components

[1] As defined in AS1726-2017 6.1.4.4

[2] In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Soil Descriptions

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component [1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type		Particle size (mm)
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 – 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as "extremely weathered material" in reports and by the abbreviation code XWM on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

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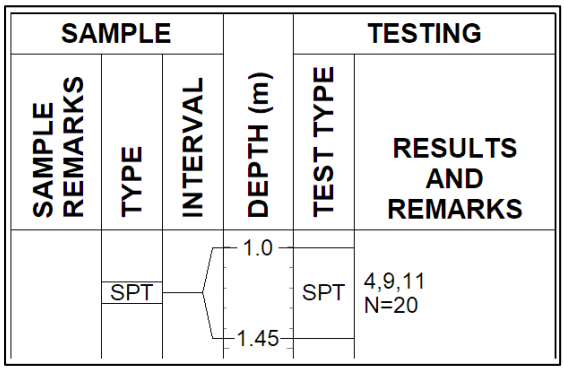
Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Driven Tube sample	DT
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U[1]
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =*x* blows for *y* mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150
Dynamic probe super heavy, followed by blow count penetration increment in mm	DPSH/100

Groundwater Observations

	water seepage/inflow
	water seepage/outflow
	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

[1] – numeric suffixes indicate tool diameter/width in mm

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 10.1 AHD
COORDINATE: E:236056.3, N:6020381.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 1
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
20/06/25 No free groundwater observed whilst augering	10 / 0	TOPSOIL / Sandy SILT (ML): dark brown; low plasticity; fine to medium sand; with clay, trace rootlets.		TOP	NA	w<PL		ES		0.10	PID	<1ppm
	0.20	Clayey SILT (ML) with sand: dark brown; low plasticity; fine to medium sand.		ALV	F	w=PL		ES		0.30	PID	<1ppm
	0.40	Silty CLAY (CI) with sand: grey-brown mottled orange; medium plasticity; fine sand.		ALV	F	w=PL to w<PL		ES		0.40 0.50	PID	<1ppm
	1 / 9	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS: * Replicate sample BD8/200625 collected at 0-0.1m

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 10.5 AHD
COORDINATE: E:236095.0, N:6020327.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 2
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	0.00	TOPSOIL / Sandy SILT (ML): dark brown; low plasticity; fine to medium sand; trace rootlets.		TOP	NA	w<PL		ES		0.10	PID	<1ppm
	0.20	SAND (SW) with silt: grey-brown; fine to coarse; well graded.		ALV	L	M to W		ES		0.50 0.60	PID	<1ppm
▼ Free groundwater observed whilst augering at 0.5m 20/06/25	0.90	Silty Sandy CLAY (CI): grey-brown mottled orange; medium plasticity; fine to medium sand.		ALV	F	w=PL		ES		1.00 1.10	PID	<1ppm
	1.10	Borehole discontinued at 1.10m depth. Limit of investigation.										

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 11.1 AHD
COORDINATE: E:236199.7, N:6020317.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 3
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
▼ Free groundwater observed whilst augering at 0.1m 20/06/25	11	0.00	TOPSOIL / Clayey SILT (ML) trace sand: dark brown grey; low plasticity; fine sand; high root fibre content, sulfur odour.		TOP	NA	w>PL		ES		0.10	PID	<1ppm
		0.20	Silty CLAY (CL) with sand: dark grey-brown; low plasticity; fine to medium sand.		ALV	VS - S	w>PL		ES		0.50	PID	<1ppm
	10	1	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 11.5 AHD
COORDINATE: E:236221.2, N:6020266.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 4
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
▼ 20/06/25 Free groundwater observed whilst augering at 0.1m	11	TOPSOIL / SILT (ML) with sand trace gravel: dark brown; low plasticity; fine to medium sand; coarse gravel; high root fibre content.		TOP	NA	w>PL		ES		0.10	PID	<1ppm
	0.20	Sandy SILT (ML) with gravel: dark brown grey; low plasticity; fine to coarse sand; fine to coarse, rounded gravel.		ALV	S - F	w>PL		ES		0.30	PID	<1ppm
	1	Borehole discontinued at 0.40m depth. Refusal on cobble riverbed.								0.40		
	10											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 12.2 AHD
COORDINATE: E:236267.4, N:6020210.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 5
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
20/06/25 No free groundwater observed whilst augering	12	TOPSOIL / Sandy SILT (ML): dark brown; low plasticity; fine to medium sand; high root fibre content.		TOP	NA	w=PL		ES		0.10	PID	<1ppm
	0.20	Sandy CLAY (CI) with silt: grey mottled orange-brown; medium plasticity; fine to coarse sand.		ALV	F - St	w=PL		ES		0.50	PID	<1ppm
	1	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		
	11											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 13.9 AHD
COORDINATE: E:236254.3, N:6020141.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 6
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
20/06/25 No free groundwater observed whilst augering		TOPSOIL / SILT (ML) with sand: dark brown; low plasticity; fine to medium sand; high root fibre content.		TOP	NA	w=PL		ES		0.10	PID	<1ppm
	0.20	Silty CLAY (CI) trace sand: dark brown grey; medium plasticity; fine to medium sand.		ALV	F	w=PL		ES		0.30	PID	<1ppm
	0.40	Silty CLAY (CH): grey-brown; high plasticity.		ALV	F - St	w=PL		ES		0.40	PID	<1ppm
		Borehole discontinued at 0.60m depth. Limit of investigation.								0.50		
										0.60		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 15.0 AHD
COORDINATE: E:236540.2, N:6020382.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 7
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	15		TOPSOIL / SAND (SW): dark grey-brown mottled orange; fine to coarse; well graded.		TOP	NA	M to W		ES		0.10	PID	<1ppm
		0.20	Clayey SAND (SW): pale grey mottled orange; fine to coarse; well graded.		RS	L - MD	W				0.50		
▼ 17/06/25 Free groundwater observed whilst augering at 0.3m									ES		0.60	PID	<1ppm
	14	1	Borehole discontinued at 0.70m depth. Auger refusal.										

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 18.0 AHD
COORDINATE: E:236631.8, N:6020330.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 8
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	18 / 0	TOPSOIL / Sandy SILT (ML): dark grey-brown; low plasticity; fine to coarse sand; trace rootlets.		TOP	NA	w=PL to W		ES		0.10	PID	<1ppm
	0.20	Silty Sandy CLAY (CI): grey-brown mottled orange; medium plasticity; fine to coarse sand.		RS	F - St	w<PL to w=PL				0.50		
▼ 17/06/25 Groundwater seepage observed whilst augering at 0.5m								ES		0.60	PID	<1ppm
	17 / 1	Borehole discontinued at 0.60m depth. Limit of investigation.										

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 24.1 AHD
COORDINATE: E:236443.5, N:6020245.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 9
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	24	0.10	TOPSOIL / FILL / Silty SAND (SW) trace gravel: grey-brown; fine to coarse; fine to medium gravel; trace rootlets; well graded.		TOP / FILL	NA	M	*BD1	ES		0.10	PID	<1ppm
			FILL / Silty SAND (SW): grey-brown; fine to coarse; reworked natural; well graded.		FILL		M to W		ES		0.50	PID	<1ppm
		0.70	Silty CLAY (CI-CH) with sand: grey-brown mottled orange; medium to high plasticity; fine sand.		RS	F	w<PL to w=PL		ES		0.60	PID	<1ppm
	23	1	Borehole discontinued at 0.90m depth. Limit of investigation.								0.80		
											0.90		

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS: * Replicate sample BD1/160625 collected at 0-0.1m

OPERATOR: ZAK
LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 24.6 AHD
COORDINATE: E:236475.1, N:6020235.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 10
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	24.6 / 0.00	TOPSOIL / FILL / Silty SAND (SW) with clay trace gravel: grey-brown; fine to coarse; coarse gravel; trace rootlets; well graded.		TOP / FILL	NA	M		ES		0.10	PID	<1ppm
	24.5 / 0.10	FILL / Silty SAND (SW): dark brown grey; fine to medium; reworked natural; well graded.		FILL		M		ES		0.20	PID	<1ppm
	24.3 / 0.30	Sandy GRAVEL (GW) with cobbles: grey; fine to coarse; fine to coarse sand; low to medium strength cobbles; well graded.		XWM	D	M to W		ES		0.30 0.40	PID	<1ppm
	24	Borehole discontinued at 0.50m depth. Limit of investigation.								0.50		
	1											
	23											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 24.9 AHD
COORDINATE: E:236459.1, N:6020229.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 11
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	24.8	0.10	TOPSOIL / FILL / Silty SAND (SW) trace gravel: dark brown grey; fine to medium; fine to medium, sub-angular to angular gravel; trace rootlets; well graded.		TOP / FILL	A	D to M		ES		0.10	PID	<1ppm
			Silty SAND (SW) trace gravel: orange-brown grey; fine to coarse; fine gravel; well graded.		XWM	L - MD	M		ES		0.40	PID	<1ppm
	24	1	Borehole discontinued at 0.50m depth. Refusal on low strength granite.								0.50	DCP9/150	Ref
	23												

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Soil Log

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 25.1 AHD
COORDINATE: E:236439.1, N:6020221.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 12
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	25	0.10	TOPSOIL / FILL / Silty SAND (SW): brown; fine to medium; trace rootlets; well graded.		TOP / FILL	NA	M	*BD2	ES		0.10	PID	<1ppm
			FILL / Silty SAND (SW): brown grey; fine to medium; reworked natural; well graded.		FILL		M		ES		0.30	PID	<1ppm
		0.60	Silty Sandy CLAY (CI): brown mottled red, orange and grey; medium plasticity.		RS	St	w<PL		ES		0.40	PID	<1ppm
	24	1	Borehole discontinued at 0.70m depth. Limit of investigation.								0.60		
											0.70		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS: * Replicate sample BD2/160625 collected at 0-0.1m

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 25.4 AHD
COORDINATE: E:236469.6, N:6020224.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 13
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	25.4 / 0.00	TOPSOIL / FILL / Silty SAND (SW) trace gravel: dark grey brown; fine to medium; fine to medium gravel; trace rootlets; well graded.		TOP / FILL	NA	M		ES		0.10	PID	<1ppm
	25.3 / 0.10	FILL / Silty SAND (SW) trace gravel: brown grey; fine to medium; fine to medium gravel; reworked natural; well graded.		FILL		M		ES		0.30	PID	<1ppm
	24.8 / 0.60	Silty SAND (SW): pale grey mottled orange; fine to coarse; well graded.		RS	L - MD	M to W		ES		0.40		
		Borehole discontinued at 0.70m depth. Limit of investigation.								0.60	PID	<1ppm
										0.70		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 25.3 AHD
COORDINATE: E:236450.9, N:6020211.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 14
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	25.3 / 0.00	TOPSOIL / FILL / Clayey SAND (SW): brown and orange-brown grey; fine to coarse; well graded.		TOP / FILL	NA	M		ES		0.10	PID	<1ppm
	25.2 / 0.10	Silty Sandy CLAY (CI): orange-brown and grey; medium plasticity.		RS	VSt - H	w<PL					DCP9/150	Ref
								ES		0.50	PID	<1ppm
	24.7 / 0.60	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 25.2 AHD
COORDINATE: E:236479.8, N:6020210.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 15
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	25.2 / 0	Clayey SAND (SW) trace gravel: brown, orange-brown and grey; fine to coarse; fine gravel; well graded.		XWM - FILL	MD - D	D to M		ES		0.10	PID	<1ppm
		Borehole discontinued at 0.10m depth. Limit of investigation.										
	25 / 1											
	24 / 2											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 25.3 AHD
COORDINATE: E:236467.7, N:6020201.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 16
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	25.3 / 0.00	FILL / Sandy GRAVEL (GP) trace silt: grey-brown; medium to coarse; fine to coarse sand; driveway (river) gravel, trace rootlets; poorly graded.		FILL	NA	D to M		ES		0.10	PID	<1ppm
	25.2 / 0.10	Clayey SAND (SW) trace gravel: brown, orange-brown and grey; fine to coarse; fine, sub-angular to angular gravel; well graded.		XWM	MD - D	D to M		ES		0.20	PID	<1ppm
	25.1 / 0.20	Borehole discontinued at 0.20m depth. Limit of investigation.										
	25											
	1											
	24											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 26.2 AHD
COORDINATE: E:236504.0, N:6020193.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 17
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	26	TOPSOIL / FILL / SAND (SW) with clay with silt: pale orange-brown grey; trace rootlets, reworked natural; well graded.		TOP / FILL	NA	M		ES		0.10	PID	<1ppm
	0.20	Sandy CLAY (CI) with silt: grey mottled orange-brown and red; medium plasticity.		RS	St	w<PL to w=PL		ES		0.50	PID	<1ppm
	1	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		
	25											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 26.5 AHD
COORDINATE: E:236525.9, N:6020175.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 18
PROJECT No: 211446.02
DATE: 16/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/06/25 No free groundwater observed whilst augering	26.5 / 0.00	TOPSOIL / FILL / SAND (SW) with silt: pale orange-brown grey; fine to coarse; trace rootlets, reworked natural; well graded.		TOP / FILL		M		ES		0.10	PID	<1ppm
	0.20	FILL / Clayey SAND (SW) with silt: grey-brown orange; fine to coarse; trace rootlets, potential reworked natural; well graded.		FILL	NA	M		ES		0.20 0.30	PID	<1ppm
	26 / 0.50	Silty CLAY (CI) with sand: grey-brown mottled orange; medium plasticity; fine to coarse sand.		RS	VSt	w<PL		ES		0.50 0.60	PID	<1ppm
		Borehole discontinued at 0.70m depth. Limit of investigation.										
	1											
	25											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 26.3 AHD
COORDINATE: E:236556.7, N:6020167.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 19
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	26	TOPSOIL / FILL / SAND (SW) with clay with silt: orange-brown and dark brown; fine to coarse; trace rootlets; well graded.		TOP / FILL		M		ES		0.10	PID	<1ppm
	0.20	FILL / SAND (SW) with clay with silt: orange-brown and grey; fine to coarse; reworked natural; well graded.		FILL	NA	M				0.50		
							*BD3	ES		0.60	PID	<1ppm
	0.70	Sandy CLAY (CI) with silt: grey-brown and orange-brown; medium plasticity; fine to coarse sand.		RS	St	w<PL		ES		0.70	PID	<1ppm
	25	Borehole discontinued at 0.80m depth. Limit of investigation.								0.80		
	1											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS: * Replicate sample BD3/170625 collected at 0.5-0.6m

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 26.6 AHD
COORDINATE: E:236503.6, N:6020172.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 20
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	26.6 / 0	TOPSOIL / Sandy SILT (ML): brown and pale orange-brown; low plasticity; fine to coarse sand; trace rootlets.		TOP / FILL	NA	w<PL		ES		0.10	PID	<1ppm
	26.4 / 0.20	SAND (SW) with silt: pale orange-brown and grey; fine to coarse; well graded.		XWM	D - VD	M				0.40	DCP9/150	5 10 15 25/100mm
								ES		0.50	PID	<1ppm
	26	Borehole discontinued at 0.50m depth. Auger refusal.										
	25.6 / 1											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 26.7 AHD
COORDINATE: E:236536.7, N:6020156.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 21
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering		TOPSOIL / FILL / Silty SAND (SW): orange-brown and dark brown; fine to coarse; trace rootlets; well graded.		TOP / FILL	NA	M		ES		0.10	PID	<1ppm
	0.20	Sandy CLAY (CI) with silt: grey-brown mottled orange-brown; medium plasticity; fine to coarse sand.		RS	St - VSt	w<PL		ES		0.50	PID	<1ppm
	26	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		
	1											
	25											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 26.9 AHD
COORDINATE: E:236485.3, N:6020155.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 22
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING AND REMARKS: TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering		0.00	TOPSOIL / Silty SAND (SW): dark brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M		ES		0.10	PID	<1ppm
		0.20	Sandy CLAY (CI) with silt: grey-brown mottled orange; medium plasticity.		RS	St	w<PL		ES		0.30	PID	<1ppm
		0.40	SAND (SW) with clay: orange-brown and grey; fine to coarse; well graded.		XWM	VD	M		ES		0.40		
											0.50	PID	<1ppm
			Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		

DCP9/150: 5 | 10 | 15 — 25/0mm

26
1
25

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 26.9 AHD
COORDINATE: E:236516.3, N:6020153.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 23
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	26.9 / 0.10	TOPSOIL / SAND (SW): orange brown and dark brown; fine to coarse; trace rootlets; well graded.		TOP / FILL	NA	M		ES		0.10	PID	<1ppm
	26.8 / 0.20	SAND (SW): dark brown; fine to coarse; well graded.		RS	MD	M		ES		0.20	PID	<1ppm
	26.6 / 0.30	Borehole discontinued at 0.30m depth. Auger refusal on extremely weathered material Moruya Tonalite.								0.30		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 27.7 AHD
COORDINATE: E:236541.3, N:6020126.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 24
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	27.7 / 0	TOPSOIL / Silty SAND (SW) with clay: dark brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M		ES		0.10	PID	<1ppm
	27.5 / 0.20	Sandy CLAY (CI) with silt: grey-brown mottled orange; medium plasticity; fine to coarse sand.		RS	St	w<PL		ES		0.50	PID	<1ppm
	27 / 0.7	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60	DCP9/150	5 10 15
	26 / 1											

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Soil Log

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 11.2 AHD
COORDINATE: E:236077.1, N:6020432.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 25
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	11	0.20	TOPSOIL / Sandy SILT (ML): dark brown; low plasticity; fine to coarse sand; trace rootlets.		TOP	NA	w=PL		ES		0.10	PID	<1ppm
			Sandy CLAY (CL) with silt: orange-brown mottled grey; low plasticity; fine to coarse sand.		RS	F - St	w<PL to w=PL		ES		0.50	PID	<1ppm
	10	1	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60	DCP 3/150	5 10 15

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 12.2 AHD
COORDINATE: E:236062.1, N:6020305.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 26
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
20/06/25 No free groundwater observed whilst augering	12	0.20	TOPSOIL / Sandy SILT (ML): dark brown; low plasticity; fine to coarse sand; trace rootlets.		TOP	NA	w<PL to w=PL		ES		0.10	PID	<1ppm
			Clayey SAND (SW) with silt: pale grey mottled orange; fine to coarse; well graded.		RS	MD	M		ES		0.50	PID	<1ppm
	11	1	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60	DCP9/150	25/90mm

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 17.9 AHD
COORDINATE: E:236173.0, N:6020411.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 27
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering		TOPSOIL / Silty SAND (SW): dark brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M		ES		0.10	PID	<1ppm
	0.20	Sandy CLAY (CI) with silt: orange-brown mottled grey; medium plasticity; fine to coarse sand.		RS	St	w<PL		ES		0.50	PID	<1ppm
		Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		
	17											
	1											
	16											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 11.9 AHD
COORDINATE: E:236170.2, N:6020295.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 28
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
20/06/25 No free groundwater observed whilst augering		TOPSOIL / Sandy SILT (ML): brown; low plasticity; fine to coarse sand; trace rootlets.		TOP	NA	w<PL	*BD9	ES		0.10		
	0.20	Clayey SAND (SW) with silt: grey-brown and orange white; fine to coarse; well graded.		RS	L - MD	D to M		ES		0.50		
		Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		
	11											
	1											
	10											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS: * Replicate sample BD9/200625 collected at 0.0-0.1m

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 14.1 AHD
COORDINATE: E:236145.7, N:6020174.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 29
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
20/06/25 No free groundwater observed whilst augering	14	0.20	TOPSOIL / Silty SAND (SW): grey-brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M		ES		0.10		
			Sandy CLAY (CI) with silt: grey mottled orange-brown; medium plasticity; fine to coarse sand.		RS	F - St	w<PL to w=PL		ES		0.50		
	13	1	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 14.4 AHD
COORDINATE: E:236202.2, N:6020209.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 30
PROJECT No: 211446.02
DATE: 20/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
20/06/25 No free groundwater observed whilst augering	14.4 / 0.00	TOPSOIL / Sandy SILT (ML): brown; low plasticity; fine to medium sand; trace rootlets.		TOP	NA	w<PL		ES		0.10	DCP9/150	5 10 15
	14 / 0.20	Sandy CLAY (CI) with silt: grey-brown mottled orange; medium plasticity; fine to coarse sand.		RS	F	w<PL		ES		0.50		
		Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		25/50mm
	1											
	13											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 19.6 AHD
COORDINATE: E:236290.9, N:6020397.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 31
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	19.6 / 0.00	TOPSOIL / Silty SAND (SW) trace gravel: dark brown; fine to coarse; sub-angular to angular gravel; trace rootlets; well graded.		TOP	NA	M to W		ES		0.10	PID	<1ppm
	19.4 / 0.20	Silty Sandy CLAY (CI): orange-brown mottled grey; medium plasticity; fine to coarse sand.		RS	St - H	w<PL		ES		0.50	PID	<1ppm
	19	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60	DCP9/150	25/20mm
	1											
	18											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 17.1 AHD
COORDINATE: E:236255.1, N:6020341.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 32
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	17 / 0	TOPSOIL / Silty SAND (SW): dark brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M to W	*BD5	ES		0.10	PID	<1ppm
	0.20 / 17	Sandy CLAY (CL) with silt: orange-brown mottled grey; low plasticity; fine to coarse sand.		RS	St	w<PL		ES		0.50	PID	<1ppm
	1 / 16	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS: * Replicate sample BD5/170625 collected at 0.0-0.1m

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 17.2 AHD
COORDINATE: E:236307.1, N:6020252.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 33
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	17 / 0.20	TOPSOIL / Silty SAND (SW): dark brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M to W		ES		0.10	PID	<1ppm
		Clayey SAND (SW): grey-brown mottled orange-brown; fine to coarse; well graded.		RS	L	M to W		ES		0.50	PID	<1ppm
		Borehole discontinued at 0.60m depth. Limit of investigation.								0.60	DCP9/150	25/50mm
	1											
	16											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 18.3 AHD
COORDINATE: E:236330.0, N:6020133.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 34
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	18	TOPSOIL / Sandy SILT (ML): dark brown; low plasticity; fine to coarse sand; trace rootlets.		TOP	NA	w<PL	*BD6	ES		0.10	PID	<1ppm
	0.20	Sandy CLAY (CL) with silt: orange-brown mottled grey; low plasticity; fine to coarse sand.		RS	St - VSt	w<PL		ES		0.50	PID	<1ppm
	1	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60	DCP9/150	25
	17											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS: * Replicate sample BD6/170625 collected at 0.0-0.1m

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 17.0 AHD
COORDINATE: E:236390.2, N:6020380.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 35
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering		TOPSOIL / Silty SAND (SW): dark grey-brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M to W		ES		0.10	PID	<1ppm
	0.20	Silty Sandy CLAY (CI-CH): grey-brown mottled orange-brown; medium to high plasticity; fine to coarse sand.		RS	F - St	w<PL		ES		0.50	PID	<1ppm
		Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		
	16											
	1											
	15											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 20.4 AHD
COORDINATE: E:236384.8, N:6020306.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 36
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	20.4 / 0.00	TOPSOIL / Silty SAND (SW): dark grey-brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M to W		ES		0.10	PID	<1ppm
	20 / 0.20	Silty CLAY (CI-CH) with sand: grey brown mottled orange-brown; medium to high plasticity; fine to medium sand.		RS	F - St	w<PL		ES		0.50	PID	<1ppm
		Borehole discontinued at 0.60m depth. Limit of investigation.								0.60	DCP9/150	25/50mm
	1											
	19											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 24.1 AHD
COORDINATE: E:236404.0, N:6020195.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 37
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	24 / 0	TOPSOIL / Silty SAND (SW): dark brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M		ES		0.10	PID	<1ppm
	0.20	Sandy CLAY (CL) with silt: pale grey-brown mottled orange; low plasticity; fine to coarse sand.		RS	St - VSt	w<PL		ES		0.50	PID	<1ppm
	23 / 1	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 27.0 AHD
COORDINATE: E:236440.0, N:6020119.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 38
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	27	TOPSOIL / SAND (SW): dark brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M		ES		0.10	PID	<1ppm
	0.20	Sandy CLAY (CL-CI) with silt: pale grey-brown mottled orange; low to medium plasticity; fine to coarse sand.		RS	St	w<PL to w=PL		ES		0.50	PID	<1ppm
	26 1	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 18.4 AHD
COORDINATE: E:236517.8, N:6020352.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 39
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	18.4 / 0.00	TOPSOIL / Silty SAND (SW): dark grey-brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M to W		ES		0.10	PID	<1ppm
	18 / 0.20	Sandy CLAY (CL) with silt: grey-brown mottled orange-brown; low plasticity; fine to coarse sand.		RS	F - St	w=PL		ES		0.50	PID	<1ppm
	17 / 1	Borehole discontinued at 0.60m depth. Hand auger refusal.								0.60		

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 19.4 AHD
COORDINATE: E:236465.3, N:6020334.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 40
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	19.4 / 0.00	TOPSOIL / Silty SAND (SW): dark grey-brown; trace rootlets; well graded.		TOP	NA	M to W		ES		0.10	PID	<1ppm
	19.2 / 0.20	Silty CLAY (CI-CH) with sand: orange-brown mottled grey; medium to high plasticity; fine to coarse sand.		RS	F - St	w=PL		ES		0.50	PID	<1ppm
	18.8 / 0.60	Borehole discontinued at 0.60m depth. Limit of investigation.								0.60	DCP9/150	25/80mm

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 22.4 AHD
COORDINATE: E:236508.9, N:6020274.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 41
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING AND REMARKS: TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	22	0.20	TOPSOIL / SAND (SW) with silt: grey-brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M to W	*BD4	ES		0.10	PID	<1ppm
			Sandy CLAY (CI) with silt: grey-brown mottled orange-brown; medium plasticity; fine to coarse sand.		RS	NA	w<PL to w=PL		ES		0.50	PID	<1ppm
			Borehole discontinued at 0.60m depth. Limit of investigation.								0.60	DCP9/150	25/100mm
	21	1											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS: * Replicate sample BD4/170625 collected at 0.0-0.1m

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 19.9 AHD
COORDINATE: E:236614.9, N:6020297.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 42
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering		TOPSOIL / SAND (SW): dark grey-brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M to W		ES		0.10	PID	<1ppm
	0.20	Clayey SAND (SW): grey-brown; fine to coarse; well graded.		RS	L	M to W		ES		0.50	PID	<1ppm
		Borehole discontinued at 0.60m depth. Limit of investigation.								0.60		
	19											
	1											
	18											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 23.3 AHD
COORDINATE: E:236589.2, N:6020214.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 43
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE		REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering	23	TOPSOIL / FILL / Silty SAND (SP): dark grey-brown; fine to medium; trace rootlets, reworked natural; poorly graded.		TOP / FILL		D		*BD7	ES		0.10	PID	<1ppm
	0.20	FILL / Silty SAND: dark grey-brown; fine to coarse; reworked natural; well graded.		FILL	NA	M			ES		0.50	PID	<1ppm
	0.80	Clayey SAND (SW) with silt: grey-brown mottled orange; fine to coarse; well graded.		RS	L	M to W			ES		1.00	PID	<1ppm
	1	Borehole discontinued at 1.10m depth. Limit of investigation.									1.10		
	22												

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS: * Replicate sample BD7/170625 collected at 0.0-0.1m

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 25.0 AHD
COORDINATE: E:236608.8, N:6020147.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 44
PROJECT No: 211446.02
DATE: 17/06/25
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*]	DENSITY.[*]	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING AND REMARKS: TEST TYPE	RESULTS AND REMARKS
17/06/25 No free groundwater observed whilst augering		0.20	TOPSOIL / SAND (SW): dark brown; fine to coarse; trace rootlets; well graded.		TOP	NA		M to W		ES		0.10	PID	<1ppm
			Clayey SAND (SW) with silt: grey-brown; fine to coarse; well graded.		RS		L	M to W		ES		0.50	PID	<1ppm
			Borehole discontinued at 0.60m depth. Limit of investigation.									0.60	DCP9/150	25/50mm
	24	1												
	23													

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand tools
METHOD: Hand tools
REMARKS:

OPERATOR: ZAK

LOGGED: ZAK
CASING: Uncased

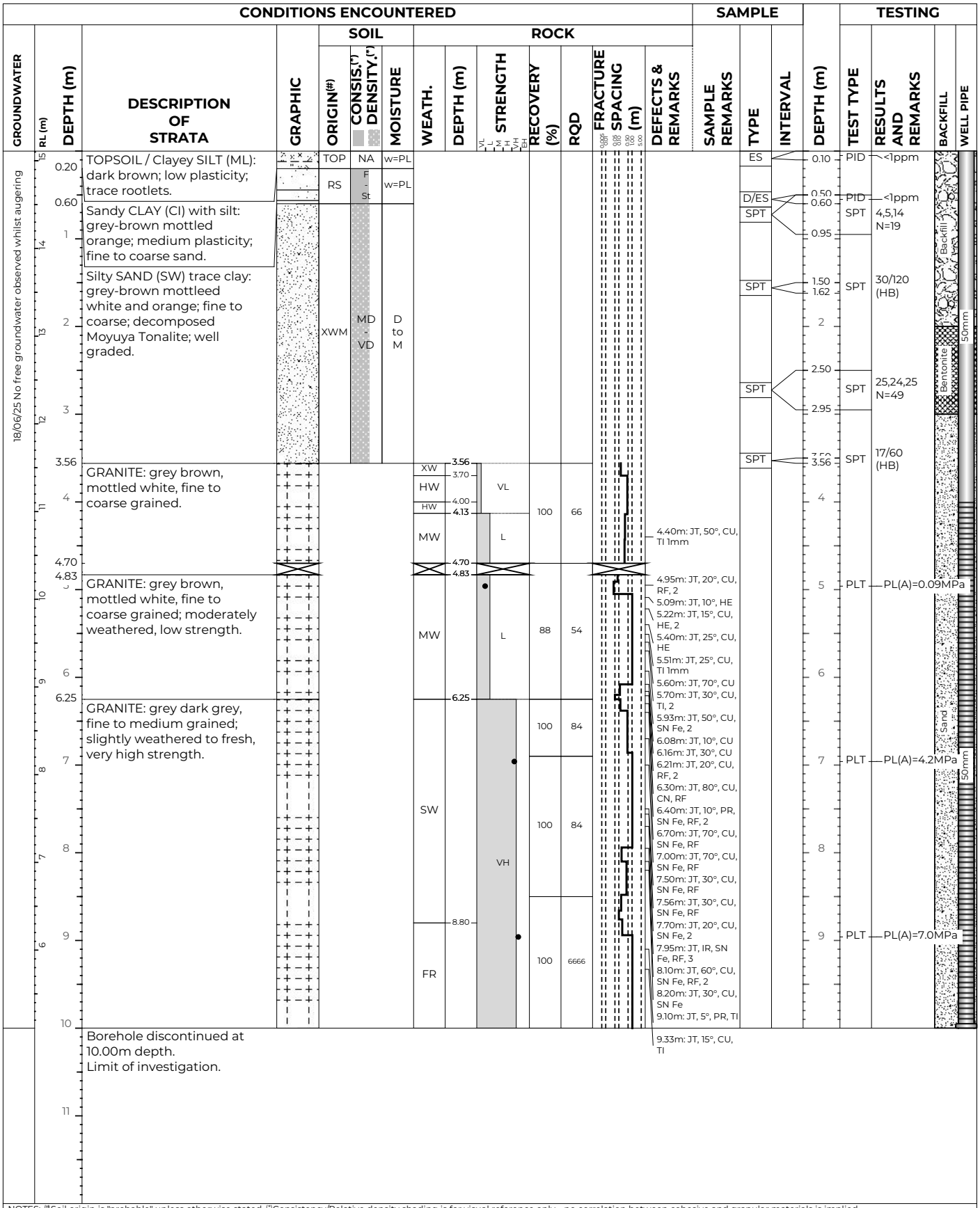
Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 15.1 AHD
COORDINATE: E:236129.0, N:6020386.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 45
PROJECT No: 211446.02
DATE: 18/06/25
SHEET: 1 of 1



NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Scout 6
METHOD: Auger/SPT to 3.56m, NMLC coring to 10.0m
REMARKS: Monitoring welll finished with monument

OPERATOR: RMX Drilling

LOGGED: ZAK
CASING: HQ to 3.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Combined Log

BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 20.4 AHD
COORDINATE: E:236564.1, N:6020302.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 46
PROJECT No: 211446.02
DATE: 19/06/25
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	TESTING DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	20	0.20	TOPSOIL / SAND (SW): dark brown; fine to coarse; trace rootlets; well graded.		TOP	NA	M									ES		0.10	PID	<1ppm		
			Silty Sandy CLAY (CI): grey-brown mottled orange; medium plasticity; fine to coarse sand.		RS	St	w<PL									D/ES		0.50	PID	<1ppm		
		1.00														SPT		0.60	SPT	2,3,7 N=10		
	19		Silty SAND (SW) trace clay: orange-brown mottled grey; fine to coarse; decomposed Moruya Tonalite; well graded.				D to M											0.95				
		2														SPT		1.50	SPT	30/110		
	18																	1.61				
		2.50														SPT		2	SPT	10,10,16 N=26		
		3			XWM	D - VD												2.95				
	17															SPT		3.50	SPT	15,21,25 N=46		
▼		4																3.95				
Free groundwater observed whilst augering at 4.0m 19/06/25							W									SPT		4.50	SPT	31,28,32 N=60		
	16	5																4.95				
		5.60							5.60							SPT		5.50	SPT	30/100		
		5.70	GRANITE: orange brown, mottled grey, fine to medium grained; very low strength.					HW XW	5.70	VL	90	90		6.45m: JT, 30°, CU, TI				5.60				
	15	6						XW	6.60		100	0		6.52m: JT, 30°, CU, TI				6				
									6.72													
		7						HW			100	80		6.85m: JT, 90°, CU, HE				7				
	14	7.20							7.20		23	0										
		8							8.00									8				
		8.00	GRANITE: orange brown; very low strength, extremely to highly weathered.					HW		VL												
	13	8.25							8.25		5	0										
		9																9				
		9.20							9.20									9.25				
	12	9.25							9.25		0	0				SPT		9.33	SPT	30/80		
		9.45						HW XW	9.45	VL	100	52										
		10							10.00									10				
	11		Borehole discontinued at 10.00m depth. Limit of investigation.																			

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Scout 6
OPERATOR: RMX Drilling
LOGGED: ZAK

METHOD: Auger/SPT to 4.95m, wash boring to 5.6m, NMLC coring to 10.0m
CASING: HW to 4.5m, then HQ to 5.5m

REMARKS: Monitoring welll finished with monument

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

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BOREHOLE LOG

CLIENT: Illawarra Retirement Trust
PROJECT: Proposed Retirement Home Development
LOCATION: 11 Spencer Street, Moruya, NSW 2537

SURFACE LEVEL: 25.4 AHD
COORDINATE: E:236415.2, N:6020154.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 47
PROJECT No: 211446.02
DATE: 18/06/25
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
18/06/25 No free groundwater observed whilst augering	25	0.20	TOPSOIL / Sandy SILT (ML): dark grey-brown; low plasticity; fine to coarse sand; trace rootlets.		TOP	NA	w<PL									ES		0.10	PID	<1ppm		
		0.70			RS	St	w<PL									D/ES		0.50	PID	<1ppm		
	24	1	Sandy CLAY (CI) with silt: pale orange-brown and grey; medium plasticity; fine to coarse sand.													SPT		0.60	SPT	4,25/120 (HB)		
			SAND (SW) with clay with silt: pale grey-brown and orange; fine to coarse; decomposed Moruya Tonalite; well graded.		XWM	D - VD	D											0.77				
	23	2														SPT		1				
																		1.50	SPT	22,22,24 N=46		
																		1.95				
	22	3														SPT		2.50	SPT	14,15,20 N=35		
		3.65							3.65									2.95				
		3.70	GRANITE: pale brown-brown mottled pale yellow, fine to medium grained; very low strength, extremely weathered.						3.70							SPT		3.50	SPT	30/150 (HB)		
	21	4						HW										3.65				
								HW XW	4.45	VL	97	85		4.83m: JT, PR, HE 1mm, 3				4				
								HW	4.80					5.08m: JT, 20°, CU, TI 1mm								
		5						HW	5.00					5.26m: JT, 20°, CU				5				
	20	5.40							5.40													
		6									0	0						6				
	19	6.52	GRANITE: brown, orange brown, fine to coarse grained; highly weathered, very low strength.					HW	6.52					6.62m: JT, 15°, CU, SN Fe								
									6.66					6.90m: JT, CU, SN Fe								
		7									87	45		7.05m: JT, 40°, CU, SN Fe				7	PLT	PL(A)=0.04MPa		
														7.20m: JT, 30°, CU, SN Fe					PLT	PL(A)=0.07MPa		
	18							HW		VL				7.30m: JT, IR, SN Fe, 3								
		8									100	42		7.70m: JT, 60°, CU, SN Fe				8				
														7.75m: JT, 90°, PR, HE								
	17	8.40	GRANITE: dark brown, white, fine to coarse grained; moderately weathered, low strength.						8.40					8.30m: FC, IR								
														8.47m: JT, 30°, CU, SN Fe								
														8.54m: JT, 60°, CU								
		9						MW		L	100	68		8.81m: JT, 40°, CU, SN Fe				9	PLT	PL(A)=0.16MPa		
	16													9.05m: JT, 55°, CU, SN Fe								
														9.48m: JT, 40°, PR								
														9.60m: JT, 50°, PR								
		10	Borehole discontinued at 10.00m depth. Limit of investigation.															10	PLT	PL(A)=0.16MPa		

Backfill
Bentonite
50mm
Sand
5mm

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Scout 6
METHOD: Auger/SPT to 3.65m, NMLC coring to 10.0m
REMARKS: Monitoring welll finished with monument

OPERATOR: RMX Drilling

LOGGED: ZAK
CASING: HQ to 3.5m

Refer to explanatory notes for symbol and abbreviation definitions

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Acid Sulfate Soil Test Results1

Table D1: Summary of Results - Acid Sulfate Soils

Project No: 211446.02

Project Name: Proposed Residential Aged Care Facility

Location: 11 Spencer Street, Moruya NSW

Sample information						Screening test results				Laboratory analysis results (acid base accounting)									
Location ID	Depth from (m)	Depth to (m)	Reduced level (AHD)	Sample description	Adopted texture	pH_F (pH units)	pH_{FOX} (pH units)	Reaction strength	pH change (pH units)	pH_{KCl} (pH units)	S_{KCl} (%S)	S_{HCl} (%S)	Scr (%S)	TAA (%S)	S_{NAS} (%S)	ANC_{BT} (%S)	ANC corroborated (Y/N or NA)	Net acidity (%S)
												Coarse texture: sands to loamy sands and peats							0.03
				Assessment criteria (pH units)		**<4**	**<3**	-	**1.0**	Action criteria (%S)		Medium texture: clayey sand to light clays							0.06[a]/0.03[b]
												Fine texture: light medium to heavy clays							0.1[a]/0.03[b]
Location ID	Depth from (m)	Depth to (m)	Reduced level (AHD)	Sample Description	Adopted Texture	pH_F (pH units)	pH_{FOX} (pH units)	Reaction Strength	pH change (pH units)	pH_{KCl} (pH units)	S_{KCl} (%S)	S_{HCl} (%S)	Scr (%S)	TAA (%S)	S_{NAS} (%S)	ANC_{BT} (%S)	ANC corroborated (Y/N or NA)	Net Acidity (%S)
1	0.00	0.10	10.11 to 10.01	TOPSOIL / Sandy SILT	F	6.3	5.6	M	0.7									
1	0.30	0.40	9.81 to 9.71	Clayey SILT	F	7.0	5.6	M	**1.4**									
1	0.50	0.60	9.61 to 9.51	Silty CLAY	F	6.9	5.9	L	0.9									
2	0.00	0.10	10.46 to 10.36	TOPSOIL / Sandy SILT	F	6.6	5.4	M	**1.2**									
2	**0.50**	**0.60**	9.96 to 9.86	SAND	C	6.8	5.7	L	**1.1**									
2	**1.00**	**1.10**	9.46 to 9.36	Silty Sandy CLAY	F	6.9	6.3	M	0.6									
3	0.00	0.10	11.05 to 10.95	TOPSOIL / Clayey SILT	F	6.6	4.3	L	**2.3**									
3	**0.50**	**0.60**	10.55 to 10.45	Silty CLAY	F	6.6	4.6	L	**2.0**	5.3				0.020				0.023
4	0.00	0.10	11.54 to 11.44	TOPSOIL / SILT	F	6.5	4.0	M	**2.5**									
4	**0.30**	**0.40**	11.24 to 11.14	Sandy SILT	F	6.7	4.3	L	**2.4**	4.6				0.020				0.061
5	0.00	0.10	12.16 to 12.06	TOPSOIL / Sandy SILT	F	6.6	5.3	M	**1.3**									
5	0.50	0.60	11.66 to 11.56	Sandy CLAY	F	6.8	5.6	L	**1.2**									
6	0.00	0.10	13.90 to 13.80	TOPSOIL / SILT	F	6.7	5.4	M	**1.2**									
6	0.30	0.40	13.60 to 13.50	Silty CLAY	F	6.7	5.6	L	**1.1**									
6	0.50	0.60	13.40 to 13.30	Silty CLAY	F	6.5	5.7	L	0.9									

Notes:

Adopted texture - C = coarse, M = medium, F = fine

pH_F - Soil pH in water

pH_{FOX} - Soil pH in peroxide

Reaction strength: L - Low , M - Medium, H - High, X - Extreme, V - Volcanic, F - Frothing (indicative of organic material)

pH change = pH_F - pH_{FOX}

pH_{KCL} - KCl extractable pH

S_{KCl} - KCl extractable sulfur

S_{HCl} - HCl extractable sulfur

S_{Cr} - potential sulfidic acidity

TAA - titratable actual acidity (reported if pH_{KCL}<6.5)

S_{NAS} - retained acidity (reported if pHKCl > 4.5)

ANC_{BT} - acid neutralising capacity (reported if $pH_{KCl} \geq 6.5$)

NT - Not tested

Blue depths indicate where samples have been collected at or below the groundwater table

Bold results are indicators of ASS conditions, noting:

- Assessment criteria are considered a reasonable initial screening for AASS or PASS
- pH_F<4 is indicative of the presence of actual ASS (AASS), although it is not conclusive of ASS on its own as naturally occurring non ASS soils can have pH_F<3
- pH_{FOX}<3 or pH change ≥1 may indicate potential ASS (PASS), although exceptions apply. Laboratory testing required to confirm presence of Reduced Inorganic Sulfur (RIS)
- Refer to Table 5.1, A2, A5 of Sullivan,L. et al (2018) for further details

Shaded results trigger action (i.e. equal to or exceed the action criteria). Criteria is specific for soil texture and anticipated tonnage of soil disturbed.

Net Acidity can only include the measured ANC where the ANC has been corroborated by other data (for example slab incubation data) that demonstrates the soil material does not experience acidification during complete oxidation under field conditions.

a - Action criterion for disturbance of 1-1000 tonnes of material

b - Action criterion for disturbance of more than 1000 tonnes of material

The action criteria apply only to ASS materials and not to other acidic soils such as acidic peatlands and coastal heaths.

Acid Sulphate Soil Suite			
Our Reference		384166-3	384166-5
Your Reference	UNITS	3	4
Depth		0.5-0.6	0.3-0.4
Date Sampled		20/06/2025	20/06/2025
Type of sample		Soil	Soil
Date prepared	-	24/06/2025	24/06/2025
Date analysed	-	25/06/2025	25/06/2025
pH $_{kcl}$	pH units	5.3	4.6
s-TAA pH 6.5	%w/w S	0.02	0.02
TAA pH 6.5	moles H^+ /t	10	16
a-Chromium Reducible Sulfur	moles H^+ /t	5	22
Chromium Reducible Sulfur	%w/w	0.008	0.04
S_{KCl}	%w/w S	[NT]	[NT]
S_{HCl}	%w/w S	[NT]	[NT]
S_{NAS}	%w/w S	[NT]	[NT]
ANC_{BT}	% $CaCO_3$	[NT]	[NT]
s-ANC_{BT}	%w/w S	[NT]	[NT]
s-Net Acidity excluding ANC	%w/w S	0.023	0.061
a-Net Acidity excluding ANC	moles H^+ /t	14	38
Liming rate excluding ANC	kg $CaCO_3$ /t	1.1	2.9
s-Net Acidity including ANC	%w/w S	0.023	0.061
a-Net Acidity including ANC	moles H^+ /t	14	38
Liming rate including ANC	kg $CaCO_3$ /t	1	3

Photo 1: General view of the residential dwelling northern facade, looking east.

Photo 2: General view of the site, taken from residential dwelling looking north-west.

Photo 3: General view of the site sloping down towards Racecourse Creek tributary, looking south-east.

Photo 4: General view of Racecourse Creek tributary, looking south.

Douglas PARTNERS	CLIENT: Illawarra Retirement Trust		**Site Photographs 1 to 4**	PROJECT No:	211446.02
	OFFICE: Wollongong	Prepared By: ZAK	**Geotechnical Assessment**	PLATE No:	1
	SCALE: NTS	DATE: 8 Jul 2025	**11 Spencer Street, Moruya NSW**	REVISION:	0

Photo 5: General view of on-grade gravelly sand driveway located off Francis Street, looking east.

Photo 6: General view of earth-mound embankment dam located in the eastern portion of the site, looking east.

Photo 7: General view of the north-eastern corner of the non-residential cut/fill platform.

Photo 8: General view of the non-residential cut / fill platform, looking south-west.

Douglas PARTNERS	CLIENT: Illawarra Retirement Trust		**Site Photographs 5 to 8**	PROJECT No: 211446.02
	OFFICE: Wollongong	Prepared By: ZAK	**Geotechnical Assessment**	PLATE No: 2
	SCALE: NTS	DATE: 8 Jul 2025	**11 Spencer Street, Moruya NSW**	REVISION: 0

Appendix C

Acid Sulfate Soil Formation, Action Criteria and Treatment Verification

1. Introduction

This appendix provides background information on acid sulfate soil formation. Details the acid sulfate soil action criteria, acid sulfate soil treatment verification criteria, equations for net acidity and waste classification criteria are also included. The action criteria are based on Sullivan, et. al. (2018).

2. Formation of acid sulfate soils

The key features of landscapes where ASS occurs include:

- Coastal lowlands below 5 m AHD i.e. tidal flats, estuaries, mangroves, and salt marshes;
- Estuarine and marine sediments;
- Floodplains and wetlands i.e. depositional environments where waterlogging persists;
- Backswamps and lagoons i.e. areas of poor drainage where organic-rich sediments accumulate; and
- Certain man-made disturbed areas where land reclamation, dredging, or drainage exposes sulfide-rich sediments to oxygen, leading to acidification.

Reduced inorganic sulfur (RIS) forms readily in landscapes under waterlogged, anoxic conditions where there is a ready supply of organic matter, sulfate and iron. Under such conditions, the formation of RIS occurs via microbially-mediated processes. The occurrence of ASS is associated with areas or regions that have previously been or are currently estuarine environments. Due to changes in sea level or geomorphologic changes to coastal systems, these sediments are often overlain by terrestrial sediments.

When ASS are exposed to air (e.g. due to bulk excavation or dewatering), the oxygen reacts with RIS in the sediment, producing sulfuric acid. This acid can be produced in large quantities and is highly mobile in water. The acid can result in severe acidification of soil and groundwater and mobilise metals (for example arsenic, iron, aluminium, copper, cobalt, zinc), nutrients (for example phosphate) and rare earth elements. The sulfuric acid generated from the site has the potential to impact site soils, groundwater and structures, and can drain into waterways causing severe short and long term socio-economic and environmental impacts, including damage to man-made structures and natural ecosystems (for example fish kills).

The factor common to all ASS materials is that RIS components have either had, or may have, a major influence on the properties or behaviour of these soil materials.

3. Action criteria

The following section provides the action criteria used to assess whether the soil is classified as PASS/ASS.

3.1 Field screening

Field screening indicators do not form part of the action criteria but can be used to provide an indication of the ASS status and to assist in selecting samples for laboratory testing. Indicators of ASS from field screening include:

- Field pH is less than or equal to pH 4;
- pH_{fox} is less than 3;
- A decrease of 1 pH unit or more from the field pH to the pH_{fox};
- Bubbling, production of heat or release of sulphur odours during pH_{fox} testing; and
- Change in colour from grey to brown tones during oxidation.

3.2 Laboratory analysis

The following Table 1 provides the action criteria. As per Sullivan, et. al. (2018).

Table 1: Action criteria

Type of material		Net acidity #	
		1-1000 t materials disturbed	>1000 t materials disturbed
Texture range	**Approx. clay (%)**	**% S-equiv**	**% S-equiv**
Fine: light medium to heavy clay	>40	≥ 0.1	≥ 0.03
Medium: clayey sand to light clays	5-40	≥ 0.06	≥ 0.03
Coarse and Peats: sands to loamy sands	<5	≥ 0.03	≥ 0.03

Notes:
Net acidity can only include a soil material measured acid neutralising capacity (ANC) where this measure has been corroborated by other data

Equation 1 is used to calculate the net acidity when the effectiveness of a soil's measured acid neutralising capacity has not been corroborated by other data.

Net acidity = potential sulfidic acidity + actual acidity + retained acidity

Net acidity = Scr + S-TAA at pH 6.5 + SNAS

4. Verification of treatment

The following section provides the equations and methods of verifying that the neutralisation treatment has been successful / completed.

4.1 Field screening

Field screening results will be considered to be acceptable when the results meet the adopted criteria. When soils do meet the following criteria, confirmatory laboratory testing should be undertaken.

- Field pH is ≥ 5.5 (but ideally between pH 6.5 and 8.5); and
- pH_{fox} ≥ 6.5.

4.2 Laboratory testing

The soil will be considered successfully treated where:

- pH_{KCL} is ≥ 6.5;
- (total actual acidity) TAA = 0; and
- Net acidity ≤ 0. Net acidity must be determined by Equation 2, below.

Equation 2 is used to calculate the verification of post-treatment net acidity.

Verification net acidity = potential sulfidic acidity + actual acidity + retained acidity – (post neutralised acid neutralising capacity – pre neutralised acid neutralising capacity)

Verification net acidity = Scr + S-TAA at pH 6.5 + SNAS – (ANCBT of treated material – ANCBT of untreated material)

5. Off-site disposal requirements

Prior to disposal off-site the soil must be classified in accordance with relevant guidelines.

PASS / ASS and treated PASS / ASS cannot be classified as virgin excavated natural material (VENM). A 'specific exemption' for treated PASS can be sought from NSW EPA under relevant waste regulations for beneficial reuse on a defined receiving site willing to accept the material, however, the application can take some time to process.

If soil is proposed to be disposed to landfill (post-treatment), it must be classified in accordance with the POEO Act, including the current guidelines, namely:

- NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste* (NSW EPA, 2014a).
- NSW EPA *Waste Classification Guidelines, Part 4: Acid Sulfate Soils* (NSW EPA, 2014b).

6. Disposal as untreated potential acid sulfate soil

Further guidance for the disposal of untreated soil as PASS is provided in Appendix E.

7. References

NSW EPA. (2014a). *Waste Classification Guidelines, Part 1: Classifying Waste*. NSW Environment Protection Authority.

NSW EPA. (2014b). *Waste Classification Guidelines, Part 4: Acid Sulfate Soils*. NSW Environment Protection Authority.

Sullivan, L., Ward, N., Toppler, N., & Lancaster, G. (2018). *National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Sampling and Identification Methods Manual*. Canberra ACT CC BY 4.0: Department of Agriculture and Water Resources.

Appendix D

Liming Rate Calculation

1. Introduction

This Appendix provides background information on selection of liming material and the equations for the calculation of liming rates.

2. Neutralising materials

Agricultural lime (aglime) is the preferred neutralisation material for the management of ASS, as this material is usually the cheapest and most readily available product for acid neutralisation. Furthermore, aglime is slightly alkaline (pH of 8.5 to 9), non-corrosive, of low solubility and does not present handling problems or generate high pH leachate and it only liberates alkalinity in the presence of acid.

Dolomite and calcined magnesia also have low solubility, however, they produce magnesium sulfate during neutralisation reactions which is quite soluble and may degrade water quality in waterways if large quantities are produced. Aglime on the other hand hydrates to gypsum which is less soluble and therefore less likely to affect water quality and also has other beneficial impacts on soil properties particularly soil structure.

- Aglime comprises calcium carbonate ($CaCO_3$), typically made from limestone that has been finely ground and sieved to a fine powder. Aglime with the following properties are the preferred neutralising agent:
- Purity of at least 98% or better (i.e. NV > 98, where NV is the neutralising value, a term used to rate the neutralising power of different forms of materials relative to pure, fine calcium carbonate which is designated NV = 100);
- NOTE: There could be economic justification for using a less pure grade of aglime, however, under these circumstances, the individual lime dosing rates described in Section 3 would need to be carefully considered, as the cost savings from using less pure material may be offset by the corresponding increase in the required dosing rates (lime volumes required), and the transport and disposal costs; and
- Fine ground (at least <0.5 mm) and dry, as texture and moisture can decrease the effective NV.

Aglime requires no specialised handling, however, use of safe work practices and good hygiene practices are recommended to avoid eye or skin contact and inhalation. Aglime should be stored in a cool, dry, well-ventilated area inaccessible to the general public (refer to aglime safety data sheets (SDS) for further details). Any aglime stockpiles (where relevant) should be covered by a tarpaulin both to minimise wind erosion and wetting, as the material is more difficult to spread when wet.

Due to its low solubility in water, aglime is not suitable for the neutralisation of leachate, which requires a product with a very quick reaction and high solubility. The most suitable neutralising agent for leachate and retained drainage water/groundwater is slaked lime or hydrated lime (calcium hydroxide ($Ca(OH)_2$)). This is made by treating burnt lime (calcium oxide (CaO)) with water (slaking) and comes as a fine white powder. It has a typical NV of about 135. Due to its very strong alkalinity (pH of about 12.5 to 13.5), slaked lime or hydrated lime should not be allowed to come into contact with the skin or be inhaled and care must be taken to not overshoot pH

adjustment with such alkaline agents. Hydrated lime is not recommended for soil neutralisation. Hydrated lime should be stored in cool protected place (e.g. locked store inaccessible to the general public) away from moisture, strong oxidants or acids and to minimise dust emissions and (refer to hydrated lime SDS for further details).

3. Liming rates

The required liming rate can be calculated from the following formula (per tonne or per m^3).

Table 1: Liming rate equations

Equation 1 for kg lime /m^3 PASS	Equation 2 for kg lime /tonne PASS
$\left(\frac{\%\ S\ x\ 623.7}{19.98}\right)\ x\ \frac{100}{ENV(\%)}\ x\ D\ x\ FOS$	$\left(\frac{\%\ S\ x\ 623.7}{19.98}\right)\ x\ \frac{100}{ENV(\%)}\ x\ FOS$

Notes:
Net acidity (%S) is derived using the maximum net acidity (%S) using the methods in Appendix C
623.7 = % S to mol H^+ / t
19.98 converts mol H^+ / t to kg $CaCO_3$/tonne
FOS = (factor of safety) = a minimum value of 1.5 needs to be adopted, although values of up to 2 can be suitable
ENV = Effective Neutralising Value (e.g. Approx. 98% for fine (0.3 mm grain size) aglime with an NV of 98%)
D = Bulk density, site specific results can be used, or the bulk densities in ASSMAC (1998)
The ENV is calculated based on the molecular weight, particle size and purity of the neutralising agent and should be assessed for proposed materials in accordance with ASSMAC (1998)

An initial liming rate (kg $CaCO_3$/t) based on the laboratory result calculation (excluding ANC) is considered appropriate based on it including a safety factor of 1.5 and the use of aglime with an NV of at least 98% and a grain size of less than 0.3 mm. The laboratory result must be multiplied by the soils bulk density (D) to convert to lime rate per volume of soil (kg $CaCO_3/m^3$).

Depending upon the source of the aglime and ultimately the representative ENV of the aglime selected, the minimum lime dosing rate may be increased or decreased. Prior to the commencement of works, the minimum lime dosing rate should be finalised following review of the ENV of the selected aglime.

The liming rate to be calculated from the analytical results should therefore be considered as a 'starting point', and pH monitoring should be done during treatment to assess the progress of the neutralisation and the need for additional mixing and/or addition of aglime. Soil will only be considered to have been successfully treated when all soil has been verified in accordance with Section 10 of the ASSMP and Appendix C.

4. References

Stone, Y., Ahern, C. R., & Blunden, B. (1998). *Acid Sulfate Soil Manual.* Acid Sulfate Soil Management Committee (ASSMAC).

Appendix E

Contingency Options to On-Site Treatment

1. Introduction

This Appendix provides the contingency options to the selected management option.

For the purpose of this ASSMP, PASS are defined by NSW EPA *Waste Classification Guidelines Part 4: Acid Sulfate Soils* (NSW EPA, 2014). PASS are defined as:

- 'Soils that contain iron sulfides or sulfidic materials that have not been exposed to air and thus are not oxidised. The pH of these soils in their undisturbed state is 5.5 or more, making them neutral or slightly alkaline.'

2. Off-site treatment and disposal

Where on site treatment of PASS is not possible and / or practical then off-site treatment at a facility appropriately licenced to accept and treat such soil can be considered. The following general procedure is recommended for off-site treatment:

The below works will be undertaken:

- Loading the soil into trucks. If the soils are wet, they will be heavier than soils as normally transported at field moisture. This should be taken into consideration when loading trucks to ensure that trucks are not overloaded;
- Transport must be conducted in a sealed truck which prevents water leaking from the truck during transport;
- Completion of site records of the above and all information required by the treatment facility, and provision of copies of these records to the treatment facility;
- Transporting of soil to the treatment facility;
- Once the ASS have been accepted by the treatment facility they will treat and manage it in accordance with their EPL conditions, subject to the verification procedures documented herein. The liming rate will be based on the liming rate specified in this ASSMP;
- Verification of the treatment of the ASS and classification of the soil by the Environmental Consultant; and
- Transport of the treated, classified ASS to the final receiving site / disposal facility.

3. Off-site disposal as potential acid sulfate soil

3.1 Potential acid sulfate soil criteria

NSW EPA (2014) states that PASS may be disposed of in water below the permanent water table, provided:

- The soils meet the definition of VENM in all aspects other than the presence of sulfidic soils or ores;
- The pH of soils in their undisturbed state is pH 5.5 or more;

- The soil has not dried out or undergone any oxidation of its sulfidic minerals;
- Soil is received at the disposal point within 16 hours of excavation, and kept wet at all times between excavation and reburial at the disposal point;
- Appropriate records are provided to the receiving site with every truck load confirming that it meets the above criteria; and
- The receiving site meets its obligations under NSW EPA (2014) and its EPL conditions.

This is applicable for direct disposal of untreated PASS to a facility licenced by the EPA to accept untreated PASS.

Prior approval from the relevant licensed facility and the NSW EPA is recommended prior to implementation of this disposal option.

3.2 **Disposal as potential acid sulfate soil**

The below works will be undertaken by appropriately trained staff:

- Agreement with receiving site on acceptance times for trucks, and allowable time lapse between excavation and acceptance by receiving site;
- Soils will be kept wet at all times, and should be sprayed with water if required to keep them wet;
- Recording of the excavation date, time and source chainage of the excavated soil;
- Inspection of the excavated soil for moisture content, material texture/ signs of contamination concern, such as anthropogenic odours, staining or inclusions by all personnel involved in the management / handling of the spoil;
- If visual inspection of the spoil identifies materials not consistent with the materials assessed in situ (e.g. anthropogenic impact or fill are observed), then the spoil will be segregated for further assessment;
- Measuring the pH in at least one sample per 50 m3, or a minimum of 10 per shift, using a calibrated pH meter;
- If the pH is less than 5.5, the soil will not be classified as PASS, and the soil will be segregated for further assessment and treatment;
- Loading the soil into trucks and ensuring the soil is moist enough to prevent it drying out during transport. Note: due to the soils being wet, they will be heavier than soils as normally transported at field moisture (PASS estimated to be approximately 2 t/m^3). This should be taken into consideration when loading trucks to ensure that trucks are not overloaded;
- Soil should be loaded and transported as soon as possible to minimise the risk of oxidisation, which prevents it from being classified as PASS;
- Transport must be conducted in a sealed truck which prevents water leaking from the truck during transport;

Completion of site records of the above;

- Completion of records of all information required by the receiving site, and provision of copies of these records to the receiving site, including copies sent with the truck driver for the load being carried;

- Transporting of soil meeting the PASS requirements to the receiving site within 16 hours of excavation (or earlier if required by the receiving site);
- Once the PASS have been accepted by the receiving site, they are required to manage it in accordance with their EPL conditions and NSW EPA (2014). It is not the role of this document to discuss management of soil once they have been accepted by the receiving site; and
- Any soil which is rejected by the receiving facility will be transported back to the site and managed in accordance with the ASSMP.

4. Reburial on-site

Where possible (and if practical to do so) the ASS can be reburied on site, several metres below the permanent water line / at least 1 m deeper than the seasonally lowest water table provided the soil meets the definition of PASS and the soil is reburied before the soil has a chance to oxidise. Strategic reburial.

There are a number of risks associated with this management option including:

- Maintaining oxygen exclusion at all stages during the burial process;
- Ability to keep oxygen away from final placement area in the long term;
- Difficulty in locating the seasonally lowest water table (ideally established through long-term monitoring prior to works commencing);
- Difficulties in placement and compaction of soils beneath a permanent water table; and
- Potential resuspension of materials.

If reburial is proposed, development of site-specific management procedures, monitoring requirements and verification testing will be required with reference to Dear et al., (2024).

5. References

Dear, S. E., Williams, K. M., McElnea, A. E., Ahern, C. R., Dobos, S. K., Moore, N. G., & O'Brien, L. E. (2024). *Queensland acid sulfate soil technical manual : soil management guidelines version 5.1.* Department of Environment, Science and Innovation.

NSW EPA. (2014). *Waste Classification Guidelines, Part 4: Acid Sulfate Soils.* NSW Environment Protection Authority.

Appendix F

Water and Groundwater Management

1. Introduction

Water is the main mechanism by which acid and metals from oxidised ASS are mobilised and transported. Careful management of water is therefore important to the effective management of potential adverse impacts from ASS disturbance. Management is required to provide control of treated waters for discharge and provide some margin for heavy rain periods.

The below sections provide potential strategies for management, assessment and disposal of water leaching from ASS, surface water and water from groundwater dewatering.

2. Leachate and surface water collection

All water that has been in contact with ASS / assumed ASS must be managed, assessed, treated and appropriately disposed of in accordance with development consent conditions / ASSMP / other relevant plan.

3. Water storage and treatment

Water from dewatering and the ASS leachate should either be pumped directly to an on-site treatment plant for treatment or should be stored in a tank or lined drains / detention basin prior to assessment / treatment. At a minimum, the combined storage should be designed to store enough water to contain leachate and extracted water from a 1 in 10-year (1 hour) storm event.

4. Water assessment for disposal

Water which has come into contact with ASS requires assessment (monitoring) and if necessary, treatment. The consent authority in the local jurisdiction should be consulted for specific approvals and target levels for disposal. It is further recommended that pre-disposal water assessment of groundwater and receiving bodies is done to ensure the target levels in Table 1 are suitable (i.e., adjustment of these target levels may be appropriate, subject to approval by the consent authority, where background concentrations for the receiving environment differ from the target levels in Table 1). The minimum monitoring requirements are outlined in Table 1, below.

Table 1: Water monitoring analytes and frequency

Test	Parameters	Comments
Groundwater		
Physical parameters	Water level, discharge rate	Monitored daily during discharge.
Field parameters	pH, EC, Eh (redox), DO, smell of noxious gases (qualitative)	Monitored daily during discharge, reducing over time. The pH of should be 6.5 to 8.5 or one pH unit from the background pH of the receiving surface water body.

Test	Parameters	Comments
Major cations, anions and nutrients	Major cations, anions and nutrients	Monitored monthly initially to characterise groundwater facies (types), and if field parameters indicate a risk, for example decreasing pH.
Metals	Total and dissolved metals (including Al and Fe)	Monitored monthly initially and if field parameters indicate a risk, for example decreasing pH.
Soil materials within dewatered zone(s)	Net Acidity, peroxide pH	This may be useful if acidic conditions are formed to assess the loss and continued existing hazard in the area of dewatering, which may improve the CSM and understanding of the site. May or may not be necessary depending on degree of risk.
Soil materials within dewatered zone(s)	Visual observations	The formation of easily identifiable minerals such as straw-yellow jarosite occurs at an advanced stage of acidification. Once formed, these sparingly soluble minerals are difficult to remove and may prolong remediation efforts.
Surface water		
Field parameters	pH, EC, DO	Monitored daily during discharge, reducing frequency over time.
Metals	Total and dissolved metals (including Al and Fe)	Monitored monthly initially and if field parameters indicate a risk, for example decreasing pH.

5. Treatment

5.1 General

The potential impacts of ASS on water generally comprise a decrease in pH, possible elevated TSS / turbidity, iron, aluminium and other metals.

Treatment of water from construction sites is commonly required for pH and TSS. Aeration and removal of TSS also generally decreases metal concentrations in the water. Therefore an on-site water treatment plant is considered likely to be suitable for treatment of ASS impacted water that has not been oxidised.

An alternative treatment method for pH is provided in Section F1.5.2 in case treatment of excess water above the capacity of the treatment plant is required.

If a suitable treatment method for man-made contaminants in the water (e.g. PFAS, VOC, PAH, TPH, BTEX, OCP, metals etc) cannot be implemented, an alternative disposal method may be required (e.g. trucking off-site to a liquid waste disposal facility or disposal to sewer in accordance with a specific Trade Waste Agreement which would need to be obtained from the relevant water / wastewater authority).

5.2 Alternative pH treatment method

It is noted that aglime is generally not suitable for the treatment of leachate / dewatering effluent due to its low solubility in water. A commercial pH adjustment product can be used, or else slaked lime (hydrated lime) as discussed below.

Alternative neutralisation materials include calcined magnesia (magnesium hydroxide, burnt magnesite, or magnesia) and calcium hydroxide (commonly called slaked or hydrated lime).

Calcined magnesia (magnesium hydroxide, burnt magnesite, or magnesia) produces a two-step reaction, which proceeds rapidly at acidic pH and slows down as higher pH is approached, and hence reduces the potential for over-neutralisation. It should be added to the leachate as a slurry and mixing achieved via use of an agitator.

A calcium hydroxide (commonly called slaked or hydrated lime) solution can be produced by stirring calcium oxide (commonly called quicklime) into water, in a container of sufficient volume (for example, a plastic 200 litre drum). The slurry should be allowed to settle, and the clear solution (which will be caustic, with a pH of approximately 12.5 to 13) can be pumped or sprayed into the standing water in small amounts, with some agitation and monitoring. This procedure should be continued until the pH is adjusted to acceptable levels. Adequate care should be taken not to 'overshoot' the desired pH with calcium hydroxide.

Quicklime is very reactive, and relatively corrosive (due to its caustic nature). When quicklime is mixed with water, the resulting reaction generates heat. Therefore, if used, the material should be added in increments to a large amount of water to control the reaction. Slaked or quicklime should not be allowed to come into contact with the skin or be inhaled during use.

As a guide, the approximate quantities of slaked lime required to neutralise acidic water (i.e. to raise the existing pH to approximately pH 7 / neutral) are provided in Table 2.

Table 2: Approximate liming rates for water for slaked lime (kg slaked lime)

Water pH	Volume of water		
	10 m^3	50 m^3	100 m^3
2	3.7	18.5	37
3	0.37	1.85	3.7
4	0.037	0.185	0.37
5	0.0037	0.0185	0.037
6	0.00037	0.00185	0.0037

6. Water discharge

Following treatment (if required) the water should be assessed to determine if it meets the EPL conditions / discharge criteria. Water meeting the conditions can then be disposed of accordingly.

Depending on site conditions, alternative options for water disposal include on-site reinjection, overland infiltration or infiltration via excavation or surface water body.