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PRELIMINARY GEOTECHNICAL ASSESSMENT REPORT:
PROPOSED COMMERCIAL / INDUSTRIAL SUBDIVISION,
58 TONGARRA ROAD, ALBION PARK

PREPARED FOR DELMO ALBION PARK PTY LTD

PROJECT ID: CES060714-AM-02-F

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1 INTRODUCTION

Consulting Earth Scientists (CES) was commissioned by Delmo Albion Park Pty Ltd (Delmo Albion Park) to undertake a preliminary geotechnical assessment of a former dairy farm located at 58 Tongarra Road, Albion Park, NSW (herein referred to as 'the site'), as shown in Figure 1. It is understood that the site is to be acquired by Delmo Albion Park and they proposed to develop the site for commercial/industrial land-use following appropriate rezoning.

The purpose of this investigation was to assess the subsurface conditions, determine geotechnical limitations and provide recommendations for foundations for future development at the site.

2 SCOPE OF WORK

The objective of the geotechnical investigation was to assess the subsurface conditions to assist the structural engineer with design of the proposed development including earthworks, footings and pavements, as necessary.

To achieve the above objective, the following scope of work was carried out:

- Review of available geological reports and maps;
- Use of a backhoe to excavate 16 test-pits across the site to provide a preliminary assessment of geotechnical conditions;
- Use of a Dynamic Cone Penetrometer (DCP) and hand penetrometer to estimate the consistency and relative density of the subsurface soils in each test-pit;
- Submission of representative samples of soil for various NATA accredited testing, including Californian Bearing Ration (CBR), Atterberg limits and compaction testing; and
- Preparation of a report detailing the results of the investigation and comments on geotechnical conditions.

3 SITE INFORMATION

Background information on the site as determined from available maps and our site inspection, is presented below.

3.1 SITE IDENTIFICATION

The site address is 58 Tongarra Road, Albion Park, NSW. The current legal description of the site is:

- Lot B in Deposited Plan 109816;
- Lot 6 in Deposited Plan 1100435; and
- Lot 1 in Deposited Plan 955731.

The site is located in the Local Government Area (LGA) of Shellharbour, Parish of Jamberoo and County of Camden. The geographical coordinates for the approximate centre of the site are 296444E and 6172837N and the general locality of the site is shown in Figure 1.

Lot B occupies an area of approximately 4.5 hectares, Lot 6 occupies an area of approximately 69 hectares and Lot 1 occupies an area of approximately 7.1 hectares. The site is immediately surrounded to the north, south and west by rural grazing land and to the east by the runway of the Illawarra Regional Airport. The existing site layout is shown in Figure 2.

3.2 SITE ZONING AND LANDUSE

At the time of the assessment the site was used predominantly for cattle grazing with associated dairy, residential properties and machinery maintenance sheds. From the site inspection, it was also apparent that a section of land in the south eastern portion of the site was previously used for the sorting and storage of materials as part of a landscaping supplies business.

It is understood that the land is to be developed for commercial/industrial land-use. The site is currently zoned under the Shellharbour Rural Local Environment Plan (LEP) 2004 as follows:

- Lot B is zoned 1(a) Agriculture Zone;
- The majority of Lot 1 is zoned 1(a) Agriculture Zone, while a section of Lot 1 bordering the Illawarra Highway is currently zoned 9(b) Arterial Roads Reservation;
- The south eastern corner of Lot 6 is zoned 9(b) Arterial Roads Reservation, the wetland in the centre of Lot 6 is zoned 7(w) Wetlands and the remainder of the site is zoned 1(a) Agriculture Zone.

The previous zoning of the site was not determined.

3.3 TOPOGRAPHY

A review of the Albion Park 1:25 000 topographic map, Sheet 9028-1-N (CMA, 1986) revealed that the site has an approximate elevation of less than 10 m AHD and is located on the valley flat below the Illawarra Escarpment. Observations made by CES during a site inspection revealed that there is a general down gradient slope of less than 5 degrees to the south east toward Frazers Creek. The portion of Lot 6 surrounding Frazers Creek is noted on the map as being subject to inundation.

Frazers Creek enters the southern portion of the site (Lot 6) and flows north-northeast through an onsite wetland and to the Macquarie Rivulet approximately 800 m north of the northern corner of Lot 6. The Macquarie Rivulet, which flows into Lake Illawarra located approximately 1.5 km to the north east of the site, also forms the western boundary of Lot 1 on the western side of Illawarra Road. Surface water falling on the site would follow local onsite drainage and either infiltrate directly into the underlying soil or flow toward Frazers Creek or Macquarie Rivulet.

3.4 GEOLOGY AND SOILS

3.4.1 Regional Geology

Review of the Kiama 1:50 000 Geological Series Sheet 9028-1 (NSW Department of Mines, 1974) indicated that the majority of the site is underlain by alluvium, gravel, beach and dune sand of the Quaternary Period. However, the south east corner of Lot 6 (underlying the existing onsite residences) is underlain by Berry Siltstone comprising mid-grey to dark-grey siltstone to fine sandstone of the Shoalhaven Group of the early-late Permian Period.

3.4.2 Soils

Review of the Kiama 1:100 000 Soil Landscape Series Sheet 9028 (Department of Conservation and Land Management, 1993) indicated that the site was situated on the Fairy Meadow soil landscape group. As described by the soil map, the landscape in which soils of the Fairy Meadow soil landscape group are found comprises alluvial plains, floodplains, valley flats and terraces bellow the Illawarra Escarpment. Local relief is less than 10 m with slopes usually less than 5%.

Soils of the Fairy Meadow soil landscape group are described as shallow to moderately deep (50-100cm) alluvial loams and siliceous sands on terraces with prairie soils and yellow podzolic soils occurring on the drainage plains. The limitations of this soil landscape group are noted as being a flood hazard, of low wet bearing strength and having highly permeable topsoil with high seasonal water tables.

3.5 HYDROGEOLOGY

The exact direction of groundwater flow was not determined from the available information. However, it is likely that the groundwater will follow the regional topography and flow generally to the north east and may follow the Frazers Creek and Macquarie Rivulet watercourses.

A search of the groundwater database at the Department of Infrastructure, Planning and Natural Resources (DIPNR) was performed (Appendix 1). The search indicated that at the time of the search there were three registered bores which exist within a 2 km radius of the centre of the site. The closest bore (GW072794) as shown on the map provided by DIPNR appears to be located on the site. However, the corresponding Work Summary sheet describes the well as being located on Lot 6 in Deposited Plan 70360, which is not part of the site. This bore is registered for Domestic Stock use and encountered water bearing zones within shale bedrock from 20 m to 20.5 metres Below Ground Level (mBGL). The salinity was recorded as being 'salty'.

Two further bores (GW031499 and GW031515) are located approximately 1 km to the north west of the site and west of Macquarie Rivulet. These bores are registered for Irrigation and Stock uses respectively. GW031515 encountered a water bearing zone in shale at 21.90 m to 22.80 m and the salinity is recorded as being 'salty'. Further water quality data was not available.

3.6 ACID SULPHATE SOIL RISK

Clause 41 of the Shellharbour Rural Local Environment Plan 2004 states that any disturbance of more than one tonne of soil, or works likely to lower the water table must address impact relating to potential acid sulfate soils.

Review of the Albion Park 1:25 000 Acid Sulfate Soils Risk map (Land and Water Conservation, 1997) revealed that Lot 1 and Lot B and the majority of Lot 6 are described as Class AP4, that is, as having a low probability of acid sulfate materials being present. In these areas, the map indicates that acid sulfate materials, if present, will be widespread, sporadic and may be buried by alluvium sediments. The depth to acid sulfate materials in areas classified as AP4 is estimated by the map to be greater than 3 m below the ground surface at the time of mapping. The map indicates that land management is generally not affected by acid sulfate soils in these areas, but highly localised occurrences may be found.

The south eastern portion of Lot 6 is noted on the map as having no known occurrence of acid sulfate materials. Land management activities in this area are not likely to be affected by acid sulfate materials.

Refer to Sections 6.4 and 7.2.4 for further assessment of ASS.

3.7 SOIL SALINITY RISK

There are no published maps indicating potential salinity risk in the vicinity of the site, however given the regional geology and hydrogeology, salinity may be a potential issue relating to the development of the site, especially if cut and fill earthworks take place.

Saline soils are naturally occurring sediments and soils containing salts. Saline soils occur naturally and are derived from weathering of naturally saline parent material, such as shale, which are marine (saltwater) deposits, or via other natural processes such as deposition via rainwater, through groundwater movement, or a combination of one or more of the above processes. Saline soils in their existing environment may not provide any indicators of their presence, however, when saline soils are disturbed during site development they can produce numerous problems due to the release of salts, which can affect plant growth, building materials, including pavements and roads, erosion and water quality.

3.8 SITE HISTORY

The following site history is a summary of information from the CES Stage 1 Environmental Site Assessment (CES, 2006):

- From 1901 to 1977, the site was owned by individuals and farmers and was most likely used for rural grazing purposes during this period. In 1977, it appears that the owners changed the name on the title to a company name, i.e. Johnston (Marks Villa) Pty Ltd and G.H. Johnston Pty Ltd. Site use from 1977 to the present was not determined however anecdotal evidence suggests that the majority of the site was used for grazing cattle, while an area near an old silo in the central portion of the site and an area in the south east corner of the site was potentially used for soil mixing for a landscaping business; and
- Anecdotal evidence suggests that filling has occurred in various areas across the site including the south west corner, other, unidentified, low lying areas and gullies, an old well and along the farm tracks. In addition, piles of fill material, which were overgrown with grass were noted in an area between the three residences and a larger area to the east of the residences. Anecdotal evidence suggests that this area was used for soil sorting as part of a landscaping business and bags of perlite were also present in the area to the east.

3.9 PROPOSED DEVELOPMENT

Based on the information provided by Delmo Albion Park, CES understands that the site is proposed to be subdivided into individual commercial / industrial allotments comprising warehouse style office buildings constructed at-grade, car-parking and service roads. Some cut and fill is proposed to alleviate flood concerns on low lying areas. A conceptual plan of the proposed development is provided as Figure 3.

4 FIELDWORK

Fieldwork was undertaken on 4 and 5th January 2007 and comprised the excavation of 16 test-pits (test-pits TP1 to TP16) across the site to provide an assessment of the soil conditions, particularly the consistency and compaction of the fill and natural soils. With the exception of TP12, all test pits were excavated within the footprint of the proposed industrial zone with test-pits TP1 to TP10 located within Lot 6 and test-pits TP11 and TP13, located within Lot B. Test-pit TP12 was located within the proposed flood zone at the northern end of Lot 6.

The fieldwork was supervised by Mr Stephen McCormack, who directed the test-pit excavations, nominated sampling and testing, and logged the encountered sub-surface lithology. The test-pits were excavated with a backhoe with an extendable boom supplied and operated by RL Narethan Pty Ltd, using a 0.5m wide bucket. The test pits were excavated to refusal on shale bedrock or approximately 4.0m depth (the approximate limit of reach for the backhoe), whichever was shallower. Dynamic Cone Penetrometer (DCP) tests were carried out adjacent to three of the test-pits (TP4, TP5 and TP10) to assist in assessing the consistency of the soil

Water was encountered in test-pits TP4 at 3.0m Below Ground Level (BGL) and TP12 at 1.0m BGL. Water was not encountered in the remaining test-pits.

Bulk samples which were representative of the fill and natural soil encountered across the site were collected from some test-pits with selected samples, which were representative of the encountered soils, submitted for general soil Classification tests including Atterberg limits, compaction testing, dispersion, Californian Bearing Ratio (CBR) and Acid Sulfate Soil (ASS) testing.

The location of each test-pit was determined using a hand held GPS unit. A summary of the test-pit information, including depths and coordinates is provided in Table 1 while their approximate locations are shown on Figure 3. A copy of the test-pit logs including the DCP results are provided in Appendix 1.

5 FIELDWORK RESULTS

5.1 SUBSURFACE CONDITIONS

Topsoil was encountered in all test-pits to an average depth of 250 mm with a maximum depth of 500 mm (TP4). The topsoil typically comprised dark brown clayey silt / silty clay with rootlets throughout. Beneath the topsoil each test-pit, with the exception of TP12 (located in the flood zone), encountered stiff to very stiff alluvial clay which was moist and predominately red-brown and grey mottled in colour. Test-pit TP12 encountered topsoil over sandy soil which in turn was underlain by soft to very soft black organic clays and silts with pockets of sand. The organic clays and silts were encountered at 1.0m BGL and corresponded to water seepage.

Shale bedrock was encountered beneath the alluvial clays in test-pits TP1, TP2, TP3, TP6, TP7 and TP8 at depth of between 0.5m and 1.8m BGL. The only fill material encountered in the test-pits was a 400 mm layer in TP2 comprising firm to stiff alluvial clay with brick and concrete inclusions.

A summary of the typical stratigraphy encountered across the industrial zone is provided in Table 2.

5.2 GROUNDWATER

Groundwater seepage was encountered in test-pits TP4 and TP12. Test-pit TP4 was located adjacent to the Frazer Creek in the south-western corner of the site and water seepage occurred at a depth of 3.0m BGL which corresponded to some sandy lenses in the alluvial clays.

As previously mentioned, water seepage in TP12, located in the flood zone at the northern end of the site, occurred at 1.0m BGL which corresponded to the transition from sandy soils to black organic clays and silts.

6 LABORATORY TEST RESULTS

Representative samples of soil and rock were collected during the fieldwork and submitted to either Australian Soil Testing Pty Ltd or Sydney Soil and Environmental Laboratory Pty Ltd, for NATA accredited testing which included:

- Atterberg limits and linear shrinkage;
- Californian Bearing Ration (CBR) tests;
- Compaction testing;
- Dispersion testing (pinhole) and
- Acid Sulfate Soil (ASS) Testing.

Laboratory test results are provided in Appendix 2, while a summary of the results is provided in the following sections.

6.1 ATTERBERG LIMITS AND LINEAR SHRINKAGE TESTING

The Atterberg limits and linear shrinkage tests were conducted on seven samples of clay-based soil to provide a broad assessment of plasticity and to provide a preliminary estimate of potential for movement of the clay with changes in moisture content. Of the seven samples, six were collected from various depths throughout the alluvial clay layer while the remaining sample was collected from the weathered shale layer.

A summary of the Atterberg limit and linear shrinkage testing results is provided in Table 3. The testing indicates that the alluvial clays and shale (once excavated and re-moulded) are typically of high plasticity with moderate potential for shrink/swell with changes in moisture content. .

6.2 COMPACTION AND CALIFORNIAN BEARING RATIO TESTS

To assist with future earthworks, pavement and slab design, representative samples of the alluvial clay soil layer were collected and submitted for standard compaction and CBR testing. Samples selected for testing from the clay material beneath the topsoil, at depths commensurate with possible future road subgrade levels based on surrounding topography and existing road levels. However, further testing is recommended when the location and level of future roads / pavements is known.

The compaction tests conducted on the silty clay soils and remoulded shale, recorded maximum dry densities of between 1.35 t m^{-3} and 1.88 t m^{-3}, with optimum moisture contents of between 11.5% and 26.0%. The soaked CBR tests returned CBR values of between 0.5% and 7%, with

an average of 3.5%. Given the variation on composition of the fill layer, CES recommends a design CBR of 3%.

A summary of the test results is provided in Table 3

6.3 DISPERSION TESTS

Five pinhole dispersion tests were carried out on selected samples from the alluvial clay layer and the results summarised in Table 3.

Of the five samples analysed, one (sample 040107-04-SM collected from TP1 at 0.5 – 1.0m depth) was classified as partially dispersive (PD2). The remaining samples were classified as non-dispersive (ND1).

6.4 ACID SULPHATE SOIL TESTS

Acid Sulphate Soils (ASS), both *potential* and *actual*, is the common name given to naturally occurring sediments and soils containing iron sulfides. The exposure of the sulfides in these soils to oxygen by drainage or excavation leads to the generation of sulphuric acid which in turn can pose a significant risk to the environment if not managed appropriately. Earthworks which disturb ASS requires a detailed management plan to be implemented.

Actual ASS (AASS) is those containing highly acidic soil horizons resulting from aeration of the soil materials that are rich in iron sulfides. The field ph of these soils are 4 or less. Potential ASS (PASS) is soils containing sulfides that have not been oxidised and the field pH of these soils is greater than 4. Both AASS and PASS is often found in the same soil profile with AASS generally overlying PASS.

To assess the presence of AASS or PASS, selected soil samples were subjected to Suspension Peroxide Oxidation Combined Acidity & Sulfate (SPOCAS) analysis by SESL and the results compared against criteria provided in the Acid Sulphate Soils Management Advisory Committee (ASSMAC, 1998) guidelines. These guidelines provide a series of trigger levels or action criteria, based on the percentage of oxidisable sulphur (or equivalent TPA/ TAA) for broad categories of soil types. If the trigger levels are exceeded then the soil is considered to be ASS. A summary of the ASSMAC criteria is provided in Table 4.

The results of the ASS testing are provided in Table 5. Based on these results, there are no actual ASS risk, although some samples represent a low to medium PASS risk. Estimated lime dosing rates, based on a factor of safety of 1.5, for those soils presenting a PASS risk is also provided in Table 5.

7 DISCUSSION AND RECOMMENDATIONS

7.1 GEOTECHNICAL CONSTRAINTS

Based on the fieldwork and inspection of surrounding structures, CES do not anticipate any significant geotechnical constraints that will influence development of the site as proposed. However, it is noted that this investigation was broad and there may be localised areas of unsuitable soils, particularly in the low-lying areas of the industrial zone.

7.2 EARTHWORKS

It is understood that the bulk excavation and filling may be undertaken to alleviate flood concerns of the low lying areas. The exact areas of excavation and filling are not currently known therefore only general discussion and recommendations is provided herein.

7.2.1 Excavation

Any excavation of the soil across the site will be readily carried out using standard excavation equipment such as excavators and backhoes. Excavation of the upper portion of the shale bedrock may be slower, however it should still be economically achievable using conventional earthmoving equipment. Deeper excavations may encounter stronger shale and require the assistance of rock breaking equipment. Although the site is reasonably distant from any adjoining structures, any use of such rock-breaking tools should consider the sensitivity of nearby structures to vibration.

7.2.2 Temporary and Long Term Batter Slopes

Where there is sufficient space for batters to be battered the temporary and permanent unsupported batter slopes given below could be adopted.

Temporary and Permanent Unsupported Batters		
Material Type	**Temporary Batter**	**Permanent Batter**
Alluvial clay	1.25H:1V	2H:1V
Shale bedrock	1H:1V	1.5H:1V

The above batters assume that the ground surface beyond the crest of the slope is horizontal and surcharge loads not placed within a distance from the crest equal to the vertical height of the cut. The permanent batter slopes should be protected against erosion by using vegetation, geotextile or similar.

7.2.3 Filling

When filling, the excavated material or imported fill, should be placed in horizontal layers not more than 0.25m loose thickness over prepared subgrade and compacted to a dry density ratio not less than 95% Standard beneath pavements and 98% Standard beneath structures.. The moisture content during compaction should be maintained at ±2% of Standard Optimum. Filling operations should generally be carried out under a Level 1 inspection and testing source as defined in AS3798 – 1996 *Guidelines on Earthworks for Commercial and Residential Developments*.

Where applicable, it is noted that filling within 1.5m of the rear of any retaining walls should be compacted using light weight equipment (*eg*. hand operated plate compactor or ride-on compactor not more than 3 tonnes static weight) in order to limit compaction-induced lateral pressures. The layer thickness should be reduced to 0.2m maximum loose thickness.

It is noted that any soils which are required to be imported onto the site for any purpose should be subjected to validation testing in accordance with the EPA (1995) *Sampling Design Guidelines* or appropriate documentation classifying the integrity of the imported material to confirm its suitability for the proposed land-use.

7.2.4 ASS Risk

As mentioned in Section 6.4, there is a low to moderate PASS risk associated with the some alluvial soils encountered across the site (Table 5). In accordance with the Acid Sulphate Soils Management Advisory Committee (ASSMAC, 1998) guidelines, a detailed management plan should be prepared and implemented prior to any excavation works for redevelopment or remediation of the site that will disturb soil.

The medium PASS risk is associated with the organic clays and silt encountered in test-pit TP12, located in the flood zone at the northern end of the site. Based on the laboratory testing results, to neutralise the PASS risk, lime may be added to this material at a rate of approximately 26 kg per tonne of soil.

Low PASS risk was found to be associated with some samples collected across the industrial zone from the red-brown and brown, silty clay (alluvial clay unit). Although not all the alluvial clay samples were assessed as having a PASS risk, CES concludes that the risk of acid sulfate soils is significant enough to warrant the development of an ASS management plan. Particularly as the ASS risk was largely associated with the upper 1.0m of the alluvial clay unit. Based on laboratory testing results undertaken as part of this investigation, the average dosing rate of lime to neutralise the PASS risk in the alluvial clay is 7.5 kg per tonne of soil. Once the PASS risk

has been treated with lime, it is recommended that the soil be re-sampled to validate the PASS risk has been neutralized.

It is noted that further assessment of ASS risk may be undertaken during detailed assessment of the site and once the areas and volumes of excavated soil are known.

7.2.5 Salinity risk

As mentioned in Section 3.7, the regional geology and hydrogeology indicates a potential salinity issue relating to the development of the site, especially if cut and fill earthworks take place. Earthworks can exacerbate problems associated with saline soils and produce salinity problems if they:

- Expose the underlying more saline soil horizons or intercept saline groundwater;
- Block or impede natural drainage pathways, which may lead to water logging;
- Change the site hydrology in a manner that increase interaction of surface water with saline soils; and
- Increase groundwater recharge and rising water table via increased infiltration due to excess watering, clearing of vegetation, or water ponding in poorly drained areas

As noted in Department of Infrastructure, Planning and Natural Resources (DIPNR, 2003b):

> *"The key to the salinity process is that salt is soluble in water. As water gains access to our buildings and infrastructure, salt can be carried with it. When water evaporates, salt crystallises and can cause physical stress on the building material as the crystals expand."*

This is not only true for dissolved salts transported into building materials but is also true for dissolved salts that move through natural materials such as soil, as evaporation from saline soil can lead to the breakdown of soil structure and erosion.

There are a number of management options used to minimise potential impacts when developing land situated on saline soils, however the most important consideration in protecting any building or structure in saline soil areas is to prevent saline soils contacting the structure that include:

It is noted that further assessment of salinity risk may be undertaken during detailed site assessment.

7.3 SUBGRADE PREPARATION

Since plans for the proposed development have not been finalized, including any earthworks involving cut and fill, CES is only able to provide the following general recommendations for subgrade preparation for the future pavements, slab-on-ground construction and other minor structures, if required:

- Strip existing topsoil material including and unsuitable materials from site (*eg*. material containing deleterious matter). Stockpile remainder for re-use as landscaping material or remove from site.
- The exposed subgrade surface should be proof rolled to a minimum density ratio of 100% standard. A NATA-registered laboratory should be engaged to monitor the compaction levels.
- During compaction and proof rolling as described above, areas which show visible heave under compaction equipment should be over-excavated a further 0.3m and replaced with suitable approved fill material and re-compacted to 100% standard.

Given that much of the subgrade is expected to comprise clay based soils, it may be necessary to construct a working platform above the prepared subgrade, comprising a minimum of 150 mm of gravel or recycled concrete, to minimise problems associated with trafficking.

7.4 FOUNDATIONS

Based on discussions with the structural engineer, it is expected that suitable foundations for the proposed industrial buildings will comprise shallow pad or strip footings founded either on the alluvial clay unit, shale bedrock or on engineered fill following earthworks. Ideally, CES recommends that footings for the proposed structure be founded on a consistent medium to provide consistency and minimise any potential differential settlements.

The alluvial clay encountered across the industrial zone was stiff to very stiff and is considered a suitable founding stratum for shallow footings, providing a maximum allowable bearing pressure of 150kPa. Should this clay or the upper portion of the shale unit be excavated and compacted in a controlled manner as engineered fill then this fill layer would also be a suitable founding medium for shallow footing, also providing a maximum allowable bearing pressure of 150kPa. Footings founded on shale may be designed for an allowable bearing pressure of 700kPa, or higher if more investigation is conducted on the strength of the shale and the presence and extent of defects within the zone of influence of footings.

It is estimated that settlements will be less than 1% of footing width under service loading.

A summary of the allowable end bearing pressure for shallow footings is provided below.

Design Parameters for Shallow Footings	
Layer / Unit	**Allowable End Bearing Pressure (kPa)**
Engineered FILL	150
Alluvial Clay	150
Shale	700

7.5 RETAINING WALLS / EXCAVATION SUPPORT

7.5.1 Flexible Retaining Walls

Where retaining walls are cantilevered or supported by a single row of anchors and some wall movements can be tolerated (flexible wall), retaining wails can be designed assuming a triangular earth pressure distribution.

Flexible retaining wall design parameters are provided below:

Design Parameters – Flexible Retaining Walls			
Material Type	**Active Earth Pressure Coefficient (K_a)**	**Passive Earth Pressure Coefficient (K_p)**	**Bulk unit Weight, Υ (kN/m^3)**
Alluvial Clay	0.35	2.5	20

7.5.2 Rigid Retaining Walls

Where ground anchors or internal props restrain retaining wail movement, or where significant movements cannot be tolerated (rigid wall), an 'at-rest' earth pressure coefficient (K_o) of 0.5 should be adopted with a trapezoidal pressure distribution.

In addition to lateral earth pressures and surcharge loads, consideration should be given to the possibility of a hydrostatic pressure due to build-up of water behind the wall (*eg.* from broken services) unless permanent subsurface drainage can be provided.

7.6 PAVEMENTS

Pavement designs are based on the subgrade materials encountered after any excavation or re-grading has taken place. At this preliminary stage the exact subgrade for the proposed roads and pavements is not known although likely to comprise either:

- Alluvial clay;
- Weathered shale; or

- Engineered fill comprising either alluvial clay, ripped shale, or a combination of both.

Each of the above are considered to be suitable as a subgrade provided it performs satisfactorily under proof rolling. The principal aim of the subgrade improvement and preparation is to provide a uniform foundation over the entire pavement formation which will not give rise to unevenness in the pavement surface under the design loads.

Soaked CBR values for samples of silty Clay and remoulded shale material was assessed as ranging from 0.5% and 7%, with an average of 3.5%. Given the variation on composition of the fill layer, CES recommends a preliminary design CBR of 3%.

At this preliminary stage, concrete road pavements are preferred, especially in truck turning and manoeuvring areas, since concrete pavements do not require particularly strong subgrade. It is more important that the subgrade be reasonably uniform in degree of support. In areas of car-parking bitumen pavements are considered adequate.

7.7 SOIL MODULUS FOR INTERNAL FLOOR SLAB DESIGN

Internal floor slabs-on-ground, reference should be made to Cement and Concrete Associations "*Industrial Floors and Pavements*" (Report No. T48, 2nd Edition dated May 1999). Furthermore, any pavement should be underlined by a minimum 200 mm layer of granular sub-base meeting the requirements of DGS 20 as defined in RTA Specification 3051. The purpose of this layer is to provide a stable base for construction equipment, provides a uniform bearing surface, reduces potential deflections at joints and facilitates load transfer across construction joints. In accordance with AS3798-1996, this layer should be compacted to a minimum density ratio of 95% modified.

For design purposes, the Youngs Moduli provided below, are recommended.

Youngs Moduli for Internal Floor Slab Design (MPa)	
Material Type	**Young's Modulus (MPa)**
Alluvial Clay	20
Shale bedrock	70

7.8 EARTHQUAKE SITE FACTOR

Structural design for earthquake loads should be carried out in accordance with the relevant provisions in AS1170.4–1993 "*Minimum Design Loads on Structures, Part 4: Earthquake Loads*".

Based on the encountered subsurface soils, and with reference to Table 2.4(a) of AS1170.4–1993, CES suggests a nominal site factor (S) for earthquake design loading to be 1.0. In addition, from Table 2.3 of AS1170.4–1996, an acceleration coefficient (α) of 0.08 for Wollongong should be used.

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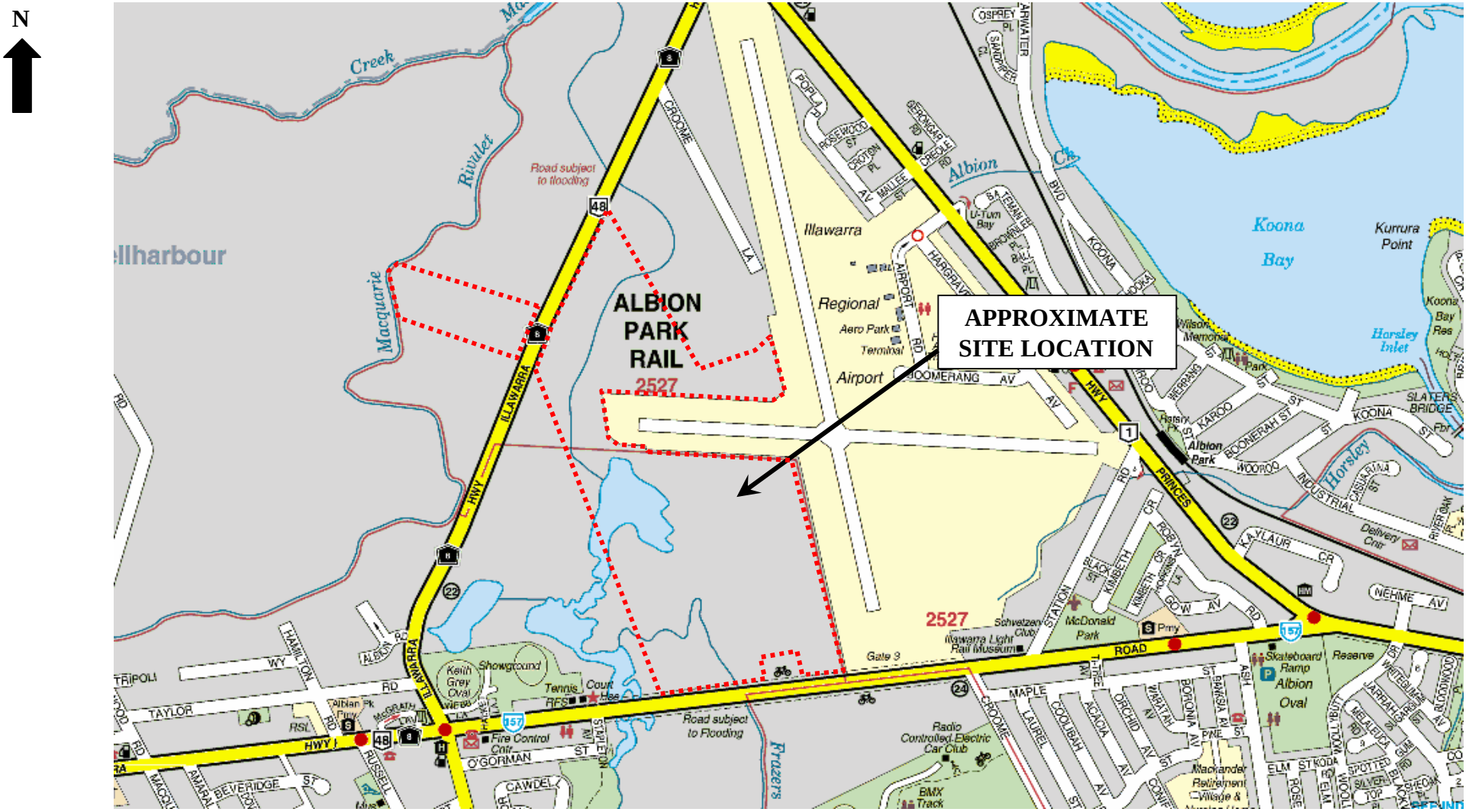
Figures



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TITLE	CES PROJECT ID	SCALE	SIZE
Figure 1: Site Location Map Tongarra Road, Albion Park	CES060714-AM	Not to scale	A4

CONSULTING EARTH SCIENTISTS
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DATE	PREPARED BY	CHECKED BY
11/08/2006	KW	CF

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Title

Figure 2 - Existing Site Layout
58 Tongarra Road, Albion Park

CES Project ID:	Date:
CES060714-AM	25/08/2006
Prepared By:	Checked By;
M.Howden	B.C.Furr

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Title

Figure 3 - 4th January 2007 Sampling

CES Project ID:	Date:
CES060714-AM	25/08/2006
Prepared By:	Checked By;
M.Howden	B.C.Furr

Tables

Table 1: Summary of Test-pit Information								
Testpit ID	**Date Completed**	**Location**	**Co-ordinates [1]**		**Elevation [2]**	**Overall Testpit Depth**	**Depth of Topsoil**	**Depth to Top of Bedrock**
			Eastings (m AGM)	Northings (m AGM)	m (AHD)	(m BGL)	(m BGL)	(m BGL)
TP1	4-Jan-07	Lot 6 Industrial Zone	297057	6172681	8.7	1.8	0.15	1.2
TP2	4-Jan-07	Lot 6 Industrial Zone	296942	6172630	13.8	1.2	0.1	0.5
TP3	4-Jan-07	Lot 6 Industrial Zone	296845	6172607	12.8	1.8	0.4	1.2
TP4	4-Jan-07	Lot 6 Industrial Zone	296646	6172652	6.0	3.8	0.5	Not determiined
TP5	4-Jan-07	Lot 6 Industrial Zone	296515	6172765	5.2	4	0.4	Not determiined
TP6	4-Jan-07	Lot 6 Industrial Zone	296810	6172795	8.7	2	0.2	Not determiined
TP7	4-Jan-07	Lot 6 Industrial Zone	297028	6172856	9.9	2.5	0.1	1
TP8	4-Jan-07	Lot 6 Industrial Zone	296888	6172968	10.4	2.2	0.3	1.8
TP9	4-Jan-07	Lot 6 Industrial Zone	296718	6173028	6.5	3.8	0.3	Not determiined
TP10	5-Jan-07	Lot 6 Industrial Zone	296571	6173152	9.8	4	0.2	Not determiined
TP11	5-Jan-07	Lot B Industrial Zone	296797	6173396	8.7	3.8	0.4	Not determiined
TP12	5-Jan-07	Lot 6 Flood Zone	296458	6173483	3.6	2.8	0.15	Not determiined
TP13	5-Jan-07	Lot B Industrial Zone	296600	6173381	7.9	2.6	0.3	Not determiined
TP14	5-Jan-07	Lot 6 Industrial Zone	296864	6173105	8.3	3.5	0.3	Not determiined
TP15	5-Jan-07	Lot 6 Industrial Zone	296700	6172869	5.8	3.5	0.25	Not determiined
TP16	5-Jan-07	Lot 6 Industrial Zone	296699	6172716	3.1	3.6	0.15	Not determiined

Note 1: Accuracy for the coordinates is on average ± 0.3 m

Note 2: Accuracy on the elevation is on average ± 1 m

Table 2: Typical Site Stratigraphy (Industrial Zone)				
Layer / Unit	**Description**	**Depth to Top of Layer (m)**	**Thickness Range (m)**	**Consistency / Relative Density[2]**
TOPSOIL	typically comprising Clayey SILT / Silty CLAY: dark brown, low plasticity, moist, with much grass roots. *This was layer was common to all test-pit locations.*	Surface	0.1 – 0.5	Not specifically assessed.
ALLUVIAL CLAY	Silty Clay (of apparent alluvial origin): red-brown, brown, orange, with some grey mottling, stiff to very stiff, moist, medium to high plasticity. Some fine to coarse ironstone gravel inclusions at depth. *This layer was encountered in all test-pits.*	0.1 – 0.5	0.5 - >4.0	Stiff to very stiff
BEDROCK	SHALE: dark brown and grey, extremely to distinctly weathered, very low to low strength, with frequent clay bands present. *Only encountered in test-pits TP1, TP2, TP3, TP6, TP7 and TP8 located in the south-eastern portion of the site..*	0.5 - >4.0	Not determined	Very low to low strength
Note 1: Thickness and depth measured from existing ground levels. Note 2: Assessed using DCP, hand tools and a Hand Penetrometer				

Table 3: Summary of Laboratory Test Results – Atterberg Limits, Linear Shrinkage, Compactions, CBR and Dispersion										
Sample ID	**Testpit / Depth**	**Moisture Content (%)**	**Liquid Limit**	**Plastic Index**	**Linear Shrinkage**	**Pinhole Dispersion Classification**	**Maximum Dry Density**	**Optimum Moisture Content**	**CBR (%)**	
					%		t/m^3	%	@ 2.5 mm penetration	@ 2.5 mm penetration
040107-01-SM	TP4/0.5-1.0m	21.5	47	24	12.0	--	1.52	24.0	5.0	6.0
040107-04-SM	TP1/0.5 – 1.0m	21.5	60	40	16.5	PD2	1.64	22.0	4.0	3.5
040107-05-SM	TP1/1.3-1.6m	12.4	--	--	--	ND1	1.60	12.0	6.0	7.0
040107-06-SM	TP5/0.4-1.0m	24.4	70	49	18.5	--	1.49	26.0	3.0	2.5
040107-11-SM	TP8/0.3-1.0m	28.4	75	46	16.5	ND1	1.35	20.5	0.5	0.5
050107-20-SM	TP10/0.3 – 0.7m	9.9	29	15	8.5	ND1	1.88	11.5	5.5	5.0
050107-21-SM	TP10/1.2 – 1.5m	15.0	46	27	12.0	--	--	--	--	--
050107-22-SM	TP11/0.4-0.8m	36.0	89	59	20.5	ND1	1.28	19.0	0.5	0.5

Table 4: Site Assessment Criteria - ASSMAC criteria based on ASS soil analysis					
Type of Material		**Action Criteria 1-1000 tonnes disturbed**		**Action Criteria if more than 1000 tonnes disturbed**	
Texture range[1]	**Approx. clay content** (%<0.002 mm)	**Sulfur trail** % S oxidisable (oven-dry basis) eg S_{TOS} or S_{POS}	**Acid trail** mol H+/tonne (oven-dry basis) eg TPA or TSA	**Sulfur trail** % S oxidisable (oven-dry basis) eg S_{TOS} or S_{POS}	**Acid trail** mol H+/tonne (oven-dry basis) eg TPA or TSA
Coarse Texture Sands to loamy sands	≤5	0.03	18	0.03	18
Medium Texture Sandy loams to light clays	>5 to <40	0.06	36	0.03	18
Fine Texture Medium to heavy clays and silty clays.	≥40	0.1	62	0.03	18
Source: Ahern *et al.* (1998a) Table 4.4.					

Table 5: Soil Analytical Results - POCAS												
Sample ID	**Testpit**	**Depth (m)**	**Date Collected**	**Matrix Unit**	**Sulfur trail**			**Acid trail**			**Assessment Summary**	**Lime Dosing Rate**
				Units	**% S (KCl)**	**% S (Peroxide)**	**% S (POS)**	**TAA**	**TPA**	**TSA (TPA – TAA)**		kg/tonne
								mol H^+.tonne^{-1}				
040107-03-SM	TP3	0.5 - 1.0	04-Jan-07	Alluvial Clay	<0.01	0.02	0.02	86	**94**	8	No actual ASS risk & low potential ASS risk	7.1
040107-01-SM	TP4	0.5 - 1.0	04-Jan-07	Alluvial Clay	<0.01	<0.01	<0.01	22	<2	<2	No actual or potential ASS risk	N/A
040107-02-SM	TP4	2.0 - 2.5	04-Jan-07	Alluvial Clay	<0.01	<0.01	<0.01	2	6	4	No actual or potential ASS risk	N/A
040107-06-SM	TP5	0.4 - 1.0	04-Jan-07	Alluvial Clay	<0.01	0.02	0.02	42	**54**	12	No actual ASS risk & low potential ASS risk	4.1
040107-09-SM	TP7	0.5 - 0.8	04-Jan-07	Alluvial Clay	<0.01	0.03	0.03	144	**176**	**32**	No actual ASS risk & low potential ASS risk	13.2
040107-13-SM	TP9	0.5 - 1.0	04-Jan-07	Alluvial Clay	<0.01	<0.01	<0.01	90	**114**	**24**	No actual ASS risk & low potential ASS risk	8.6
050107-20-SM	TP10	0.3 - 0.7	05-Jan-07	Alluvial Clay	<0.01	<0.01	<0.01	2	6	4	No actual or potential ASS risk	N/A
050107-22-SM	TP11	0.4 - 0.8	05-Jan-07	Alluvial Clay	<0.01	0.01	0.01	62	**122**	**60**	No actual ASS risk & low potential ASS risk	9.2
050107-24-SM	TP12	1.5 - 2.0	05-Jan-07	Organic Clay	<0.01	0.22	**0.22**	194	**346**	**152**	No actual ASS risk & medium potential ASS risk	26
050107-25-SM	TP16	0.5 - 0.7	05-Jan-07	Alluvial Clay	<0.01	<0.01	<0.01	26	<2	<2	No actual or potential ASS risk	N/A
050107-26-SM	TP16	0.0 - 0.15	05-Jan-07	Topsoil	<0.01	<0.01	<0.01	18	6	<2	No actual or potential ASS risk	N/A
050107-27-SM	TP16	3.0 - 3.5	05-Jan-07	Alluvial Clay	<0.01	<0.01	<0.01	22	**34**	12	No actual ASS risk & low potential ASS risk	2.6
Guideline Criteria (assuming fine texture and >1000 tonnes is disturbed)					**--**		**0.03**	**--**	**18**		--	--

Note 1: Results in **bold** and *italics* exceed the relevant action criteria

Appendix 1
Borehole Logs

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP1**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	297057	AGM	**Date Commenced:**	4-Jan-2007	**Logged by:** SM
Y-Coord:	6172681		**Date Completed:**	4-Jan-2007	**Checked by:** SM
Surface Elevation:	8.7	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			CH	TOPSOIL: Clayey Silt: brown, low plasticity with rootlets throughout	M	F				
								M	St/VSt				
							Silty CLAY: brown, low plasticity becoming red-grey mottled and medium to high plasticity from 0.5m			040107-04-SM	B		
1	-1						SHALE: dark brown and brown, extremely weathered, weak to very weak.			040107-05-SM	B		
2	-2						Practical refusal at 2.0m						
3	-3												
4	-4												

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP2**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296942	AGM	**Date Commenced:**	4-Jan-2007	**Logged by:** SM
Y-Coord:	6172630		**Date Completed:**	4-Jan-2007	**Checked by:** SM
Surface Elevation:	13.8	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: dark brown, low plasticity with rootlets throughout	M	F				
						CH	FILL: red-brown, high plasticity with some bricks	M	F				
1	-1						SHALE: brown and dark grey, extremely weathered, weak to very weak.						
							Practical refusal at 1.2m						
2	-2												
3	-3												
4	-4												

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston	Refer to Standard Sheets for details of abbreviations
Machine Type:	Backhoe	**Operators Licence No.:**		

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP3**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296845	AGM	**Date Commenced:**	4-Jan-2007	**Logged by:** SM
Y-Coord:	6172607		**Date Completed:**	4-Jan-2007	**Checked by:** SM
Surface Elevation:	12.8	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: dark brown, low plasticity with rootlets throughout	M	F				
						CH	Silty CLAY: red-brown, medium to high plasticity with trace of fine sand and rootlets throughout	M	St/VSt	040107-03-SM	B		
1	-1						SHALE: brown and dark grey, extremely weathered, weak to very weak.						
2	-2						Practical refusal at 1.8m						
3	-3												
4	-4												

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP4/DCP1**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296646 AGM		**Date Commenced:**	4-Jan-2007	**Logged by:** SM
Y-Coord:	6172652		**Date Completed:**	4-Jan-2007	**Checked by:** SM
Surface Elevation:	6	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description: SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm)	
0	0	Excavation	None			OL/OH	TOPSOIL: Silty Clay/Clayey Silt: dark brown, low plasticity with rootlets throughout	M	F				
						CH	Silty CLAY: dark brown, medium to high plasticity, trace of fine sand and rootlets throughout	M	St	040107-01-SM	B		
1	-1							M	F/St				
						CH	Silty CLAY: brown-grey mottled, medium to high plasticity with some fine sand	M	St/VSt	040107-02-SM	B		
2	-2												
3	-3			▷			Silty CLAY: water seepage below 3.0m						
4	-4						Terminated @ 3.8m						

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP5/DCP3**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296515	AGM	**Date Commenced:**	4-Jan-2007	**Logged by:** SM
Y-Coord:	6172765		**Date Completed:**	4-Jan-2007	**Checked by:** SM
Surface Elevation:	5.2	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: dark brown, low plasticity with rootlets throughout	M	F				
						CH	Silty CLAY: red-brown and brown mottled, high plasticity with some fine rootlets	M	St	040107-06-SM	B		
1	-1					CH	Silty CLAY: becoming predominately brown with grey mottling and with trace of fine sand	M					
							Silty CLAY: ironstone banding present below 2.2m		VSt				
2	-2												
3	-3									040107-07-SM	B		
4	-4						Terminated @ 4.0m						

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP6**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296810	AGM	**Date Commenced:**	4-Jan-2007	**Logged by:** SM
Y-Coord:	6172795		**Date Completed:**	4-Jan-2007	**Checked by:** SM
Surface Elevation:	8.7	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description (SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components)	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: dark brown, low plasticity with rootlets throughout	M	F				
						CL	Silty CLAY: brown, medium plasticity with fine rootlets	M	St				
						CH	Silty CLAY: red-brown, high plasticity trace of fine sand	M	VSt	040107-08-SM	B		
1	-1						SHALE: brown and dark grey, extremely weathered, weak to very weak.						
2	-2						Practical refusal at 2.0m						
3	-3												
4	-4												

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP7**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	297028	AGM	**Date Commenced:**	4-Jan-2007	**Logged by:** SM
Y-Coord:	6172856		**Date Completed:**	4-Jan-2007	**Checked by:** SM
Surface Elevation:	9.9	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: dark brown, low plasticity with rootlets throughout	M	F				
						CL		M	St				
						CH	Silty CLAY: brown, medium plasticity with fine rootlets	M	VSt				
							Silty CLAY: red-brown, high plasticity trace of fine sand			040107-09-SM	B		
1	-1						SHALE: brown and dark grey, extremely weathered, weak to very weak.						
2	-2												
3	-3						Practical refusal at 2.5m						
4	-4												

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP8**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296888	AGM	**Date Commenced:**	4-Jan-2007	**Logged by:** SM
Y-Coord:	6172968		**Date Completed:**	4-Jan-2007	**Checked by:** SM
Surface Elevation:	10.4	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: dark brown, low plasticity with rootlets throughout	M	F				
						CH	Silty CLAY: dark brown, high plasticity with trace of fine sand and fine rootlets throughout	M	St	040107-11-SM	B		
						CH	Silty CLAY: red-brown, high plasticity with a trace of fine sand	M	VSt				
1	-1					CH	Silty CLAY: red-brown and grey mottled, high plasticity.	M	Vst	040107-12-SM	B		
2	-2						SHALE: brown and dark grey, extremely weathered, weak to very weak.						
							Practical refusal at 2.2m						
3	-3												
4	-4												

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP9**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296718 AGM		**Date Commenced:**	4-Jan-2007	**Logged by:** SM
Y-Coord:	6173028		**Date Completed:**	4-Jan-2007	**Checked by:** SM
Surface Elevation:	6.5	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: dark brown, low plasticity with rootlets throughout	M	F				
						ML	SILT: brown, low plasticity with roots throughout	M	St				
						CH	Silty CLAY: dark brown, high plasticity with fine rootlets throughout and trace of fine sand. becoming red-brown from 0.5	M	VSt	040107-13-SM	B		
1	-1						becoming orange brown and grey mottled from 1.2m			040107-14-SM	B		
2	-2					Hd	becoming dark grey and fissured (possible residual)	M	Hd				
3	-3												
4	-4						Terminated @ 3.8m						

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP10/DCP2**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296571 AGM		**Date Commenced:**	5-Jan-2007	**Logged by:** SM
Y-Coord:	6173152		**Date Completed:**	5-Jan-2007	**Checked by:** SM
Surface Elevation:	9.8	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: dark brown, low plasticity with fine to coarse gravel and rootlets throughout	M	F				
						CL	Sandy CLAY: brown, low plasticity, fine to coarse sand with fine to medium gravel (possible fill)	M	VSt	050107-20-SM	B		
1	-1					CH	Silty CLAY: brown, high plasticity, fine to coarse sand and trace of fine gravel	M	VSt	050107-21-SM	B		
2	-2					CH	Silty CLAY: brown and grey mottled, high plasticity, slightly fissured (possible residual)	M	VSt/Hd				
3	-3												
4	-4						Terminated @ 4.0m						

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP11**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	
Location:	Albion Park NSW		Sheet: 1 of 1

X-Coord:	296797	AGM	**Date Commenced:**	5-Jan-2007	**Logged by:** SM
Y-Coord:	6173396		**Date Completed:**	5-Jan-2007	**Checked by:** SM
Surface Elevation:	8.7	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None				TOPSOIL: Clayey Silt: dark brown, low plasticity with trace fine sand and rootlets throughout	M	F				
						CH	Silty CLAY: red-brown, high plasticity trace of fine sand.	M	VSt	050107-22-SM	B		
1	-1						becoming reddish brown from 1.1m						
2	-2					CH	Silty CLAY: orange brown and grey mottled, high plasticity, with fine to coarse sand and fine to medium ironstone gravel.	M	VSt				
3	-3						more ironstone banding with depth						
4	-4						Terminated @ 3.8m						

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP12**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296458	AGM	**Date Commenced:**	5-Jan-2007	**Logged by:** SM
Y-Coord:	6173483		**Date Completed:**	5-Jan-2007	**Checked by:** SM
Surface Elevation:	3.6	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Silty Clay: brown, low plasticity with fine to medium sand, fine to medium gravel and and rootlets throughout.	M	F				
						SP	SAND: red-grey mottled, fine to coarse, trace of silt and intermittant pockets of sandy clay.	M	MD	050107-22-SM	B		
1	-1					ML	Clayey SILT: black, low to medium plasticity, high organic content. Some pockets of clay and sand	W	S				
2	-2												
3	-3						Terminated @ 2.8m (Collapsing)						
4	-4												

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP13**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	
Location:	Albion Park NSW		Sheet: 1 of 1

X-Coord:	296600 AGM		**Date Commenced:**	5-Jan-2007	**Logged by:** SM
Y-Coord:	6173381		**Date Completed:**	5-Jan-2007	**Checked by:** SM
Surface Elevation:	7.9	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: brown, low plasticity with fine to medium sand, fine to coarse gravel and and rootlets throughout.	M	F				
						CH	Silty CLAY: red-brown mottled, high plasticity, trace of fine sand	M	St/VSt				
1	-1						becoming orange and grey mottled						
2	-2												
							Terminated @ 2.6m						
3	-3												
4	-4												

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP14**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296864	AGM	**Date Commenced:**	5-Jan-2007	**Logged by:** SM
Y-Coord:	6173105		**Date Completed:**	5-Jan-2007	**Checked by:** SM
Surface Elevation:	8.3	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: brown, low plasticity with fine to medium sand and and rootlets throughout.	M	F				
						CH	Silty CLAY: red-brown mottled, high plasticity, trace of fine sand	M	St				
1	-1												
						CH	Silty CLAY: orange and grey mottled, high plasticity with trace of fine sand and fine to medium gravel. Occassional pockets of clayey sand.	M	VSt				
2	-2												
						CL	Sandy CLAY: grey-red mottled, medium plasticity, fine to coarse sand.	M	VSt				
3	-3												
						CH	Silty CLAY: grey, high plasticity with trace of fine sand (possible residual)	M	Hd				
							Terminated @ 3.5m						
4	-4												

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP15**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296700	AGM	**Date Commenced:**	5-Jan-2007	**Logged by:** SM
Y-Coord:	6172869		**Date Completed:**	5-Jan-2007	**Checked by:** SM
Surface Elevation:	5.8	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Clayey Silt: brown, low plasticity with fine to medium sand and and rootlets throughout.	M	F				
						CH	Silty CLAY: brown, high plasticity, trace of fine sand and roots throughout.	M	St VSt				
1	-1												
2	-2						becoming orange and grey mottled						
3	-3					CH	Sandy CLAY: Orange and grey mottled, medium to high plasticity, fine to medium sand (possible residual)	M	VSt				
4	-4						Terminated @ 3.5m						

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Project ID:	CES060714-AM	CONSULTING EARTH SCIENTISTS	**Borehole ID: TP16**
Client:	Ashe Morgan	1/111 Moore Street Leichhardt NSW 2040	
Site Name:	58 Tongarra Road	PH: (02) 8585 4888 FAX: (02) 9550 9560	Sheet: 1 of 1
Location:	Albion Park NSW		

X-Coord:	296699	AGM	**Date Commenced:**	5-Jan-2007	**Logged by:** SM
Y-Coord:	6172716		**Date Completed:**	5-Jan-2007	**Checked by:** SM
Surface Elevation:	3.1	m AHD	**Hole Diameter (mm):**	3m x 0.5m	

Drilling Information					LITHOLOGY					Samples		Tests	Notes and additional observations
Depth (mBGL)	R.L. (mAHD)	Method	Support	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics, colour, secondary and minor components	Moisture	Consistency / Density	Sample ID	Type	Dynamic Cone Penetrometer (Blows / 100 mm) 2 4 6 8 10 12 14 16	
0	0	Excavation	None			OL	TOPSOIL: Silty Clay: brown, low plasticity with fine to medium sand and rootlets throughout.	M	F	050107-26-SM	D		
						CH	Silty CLAY: dark brown, high plasticity, trace of fine sand and roots throughout.	M	St				
									VSt	050107-25-SM	D		
1	-1						becoming red-brown mottled						
2	-2												
3	-3					CH	Silty CLAY: red-white-brown, high plasticity, trace of fine to coarse sand and tine to medium gravel (ironstone). Rare fine rootlets throughout.	M	VSt	050107-27-SM	D		
4	-4						Terminated @ 3.5m						

Drill Company:	N & T Johnston	**Operator Name:**	Tony Johnston
Machine Type:	Backhoe	**Operators Licence No.:**	

Refer to Standard Sheets for details of abbreviations

Appendix 2
Soil Testing Results

SPOCAS Profile

CLIENT: **Consulting Earth Scientists**
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: **08/01/2007**

SAMPLE: Batch N°: **2811** Sample N°: **1**
Name: **040107-01-SM**
Test Type: **sPOCAS**

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000 QEC 21680

Sydney Environmental and Soil Laboratory
Specialists in Soil Chemistry, Agronomy and Contamination Assessment

Tests are performed under a quality system certified as complying with ISO 9001: 2000. Results and conclusions assume that sampling is representative. This document shall not be reproduced except in full.

Sydney Environmental & Soil Laboratory Pty Ltd
ABN 70 106 810 708
16 Chilvers Road
Thornleigh NSW 2120
Australia
Address mail to:
PO Box 357
Pennant Hills NSW 1715
Tel: 02 9980 6554
Fax: 02 9484 2427
Em: info@sesl.com.au
Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	5.38	strong acidity
pH in H_2O_2	5.39	strong acidity
Δ pH unit	-0.01	insignificant pH change
Acidity Trail		
TPA mol H+/t	< 2	
TAA mol H+/t	22	some actual acidity
TSA mol H+/t	< 2	little to no potential acidity
Sulphur Trail		
% S_P	< 0.01	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	< 0.01	little to no potential sulfur activity
Derived Values		
% S_{TPA} *	< 0.01	
Lime Requirement (kg/tonne) **	-0.20	no lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H^+ / tonne soil.
** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows strong acidity and no change in pH upon oxidation, suggesting there is no further potential acidity. The acidity is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). There is little to no actual or potential sulfur activity, all of which indicates no actual or potential Acid Sulfate Soil risk.

This soil has **no actual or potential Acid Sulfate Soil risk**. This soil does not need to be treated as an ASS, and works can proceed without further consideration of ASS. No lime requirements are necessary.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report
24/01/2007

SPOCAS Profile

CLIENT: **Consulting Earth Scientists**
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: **08/01/2007**

SAMPLE: Batch N°: **2811** Sample N°: **2**
Name: **040107-03-SM**
Test Type: **sPOCAS**

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000 QEC 21650

Sydney Environmental and Soil Laboratory
Specialists in Soil Chemistry, Agronomy and Contamination Assessment

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Pennant Hills NSW 1715
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Fax: 02 9484 2427
Em: info@sesl.com.au
Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	3.74	extreme acidity
pH in H_2O_2	3.86	extreme acidity
Δ pH unit	-0.12	slight pH increase
Acidity Trail		
TPA mol H+/t	94	
TAA mol H+/t	86	significant actual acidity
TSA mol H+/t	8	little potential acidity
Sulphur Trail		
% S_P	.02	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	.02	very slight potential sulfur activity
Derived Values		
% S_{TPA} *	.15	more acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	7.10	some lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H^+ / tonne soil.

** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows extreme acidity, some which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). Upon oxidation the soil shows potential acidity combined with very slight sulfur activity which results in a low potential ASS risk.

This soil has **no actual ASS risk and a low potential ASS risk.** This can be easily managed by incorporating the above additions of lime, which will neutralise any risk. Once the soil has been treated with lime, it is recommended the soil be resampled to validate the ASS risk has been neutralised.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia

Checked by ..... Simon Lepke

Consultant ..... Stacy Crook

Date of Report
24/01/2007

SPOCAS Profile

CLIENT: **Consulting Earth Scientists**
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: **08/01/2007**

SAMPLE: Batch N°: **2811** Sample N°: **3**
Name: **040107-06-SM**
Test Type: **sPOCAS**

Quality System
Quality Endorsed Company
AS/NZS ISO 9001:2000 QEC 21650

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Specialists in Soil Chemistry, Agronomy and Contamination Assessments

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Em: info@sesl.com.au
Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	4.34	extreme acidity
pH in H_2O_2	4.13	extreme acidity
Δ pH unit	0.21	slight pH drop
Acidity Trail		
TPA mol H+/t	54	
TAA mol H+/t	42	significant actual acidity
TSA mol H+/t	12	little potential acidity
Sulphur Trail		
% S_p	.02	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	.02	very slight potential sulfur activity
Derived Values		
% S_{TPA} *	.09	more acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	4.10	some lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H^+ / tonne soil.
** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows extreme acidity, some which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). Upon oxidation the soil shows potential acidity combined with very slight sulfur activity which results in a low potential ASS risk.

This soil has **no actual ASS risk and a low potential ASS risk.** This can be easily managed by incorporating the above additions of lime, which will neutralise any risk. Once the soil has been treated with lime, it is recommended the soil be resampled to validate the ASS risk has been neutralised.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia

Checked by .....
Simon Leake

Consultant .....
Stacy Crook

Date of Report
24/01/2007

SPOCAS Profile

CLIENT: **Consulting Earth Scientists**
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: **08/01/2007**

SAMPLE: Batch N°: **2811** Sample N°: **4**
Name: **040107-09-SM**
Test Type: **sPOCAS**

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000 QEC 21050

Sydney Environmental and Soil Laboratory
Specialists in Soil Chemistry, Agronomy and Contamination Assessment

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PO Box 357
Pennant Hills NSW 1715
Tel: 02 9980 6554
Fax: 02 9484 2427
Em: info@sesl.com.au
Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	3.52	extreme acidity
pH in H_2O_2	3.84	extreme acidity
Δ pH unit	-0.32	slight pH increase
Acidity Trail		
TPA mol H+/t	176	
TAA mol H+/t	144	very significant actual acidity
TSA mol H+/t	32	significant potential acidity
Sulphur Trail		
% S_P	.03	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	.03	very slight potential sulfur activity
Derived Values		
% S_{TPA} *	.28	more acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	13.20	some lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H^+ / tonne soil.
** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows extreme acidity, some which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). Upon oxidation the soil shows significant potential acidity combined with very slight sulfur activity which results in a low potential ASS risk.

This soil has **no actual ASS risk and a low potential ASS risk.** This can be easily managed by incorporating the above additions of lime, which will neutralise any risk. Once the soil has been treated with lime, it is recommended the soil be resampled to validate the ASS risk has been neutralised.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report
24/01/2007

SPOCAS Profile

CLIENT: Consulting Earth Scientists
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: 08/01/2007

SAMPLE: Batch N°: 2811 Sample N°: 5
Name: 040107-13-SM
Test Type: sPOCAS

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000
QEC 21650

Sydney Environmental and Soil Laboratory

Specialists in Soil Chemistry, Agronomy and Contamination Assessments

Tests are performed under a quality system certified as complying with ISO 9001: 2000. Results and conclusions assume that sampling is representative. This document shall not be reproduced except in full.

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PO Box 357
Pennant Hills NSW 1715
Tel: 02 9980 6554
Fax: 02 9484 2427
Em: info@sesl.com.au
Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	3.66	extreme acidity
pH in H_2O_2	3.84	extreme acidity
Δ pH unit	-0.18	slight pH increase
Acidity Trail		
TPA mol H+/t	114	
TAA mol H+/t	90	significant actual acidity
TSA mol H+/t	24	significant potential acidity
Sulphur Trail		
% S_P	< 0.01	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	< 0.01	little to no potential sulfur activity
Derived Values		
% S_{TPA} *	.18	acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	6.60	some lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H+ / tonne soil.

** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows extreme acidity, which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). There is little to no actual or potential sulfur activity, all of which indicates no actual or potential Acid Sulfate Soil risk.

While this soil is extremely acidic, it has **no actual or potential Acid Sulfate Soil risk.** This soil does not need to be managed as an ASS, and works can proceed without further consideration of ASS. The extreme acidity can be easily managed by incorporating the above additions of lime.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report 24/01/2007

SPOCAS Profile

CLIENT: **Consulting Earth Scientists**
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: 08/01/2007

SAMPLE: Batch N°: **2811** Sample N°: **6**
Name: **040107-02-SM**
Test Type: **sPOCAS**

Quality System
Quality Endorsed Company
AS/NZS ISO 9001:2000 QEC 21650

Sydney Environmental and Soil Laboratory

Specialists in Soil Chemistry, Agronomy and Contamination Assessments

Tests are performed under a quality system certified as complying with ISO 9001: 2000. Results and conclusions assume that sampling is representative. This document shall not be reproduced except in full.

Sydney Environmental & Soil Laboratory Pty Ltd
ABN 70 108 810 706
16 Chilvers Road
Thornleigh NSW 2120
Australia
Address mail to:
PO Box 357
Pennant Hills NSW 1715
Tel: 02 9980 6554
Fax: 02 9484 2427
Em: info@sesl.com.au
Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH In KCl	5.83	medium acidity
pH in H_2O_2	5.63	medium acidity
Δ pH unit	0.20	slight pH drop
Acidity Trail		
TPA mol H+/t	6	
TAA mol H+/t	2	slight actual acidity
TSA mol H+/t	4	little potential acidity
Sulphur Trail		
% S_P	< 0.01	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	< 0.01	little to no potential sulfur activity
Derived Values		
% S_{TPA} *	.01	acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	0.50	very little lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H+ / tonne soil.

** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows medium acidity, which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). There is little to no actual or potential sulfur activity, all of which indicates no actual or potential Acid Sulfate Soil risk.

While this soil is acidic, it has **no actual or potential Acid Sulfate Soil risk.** This soil does not need to be managed as an ASS, and works can proceed without further consideration of ASS. The acidity can be easily managed by incorporating the above small additions of lime.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe. Wollongbar, NSW, Australia

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report
24/01/2007

SPOCAS Profile

CLIENT: Consulting Earth Scientists
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: 08/01/2007

SAMPLE: Batch N°: 2811 Sample N°: 7
Name: 050107-20-SM
Test Type: sPOCAS

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000
QEC 21650

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Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	5.78	medium acidity
pH in H_2O_2	5.96	medium acidity
Δ pH unit	-0.18	slight pH increase
Acidity Trail		
TPA mol H+/t	6	
TAA mol H+/t	2	sight actual acidity
TSA mol H+/t	4	little potential acidity
Sulphur Trail		
% S_p	< 0.01	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	< 0.01	little to no potential sulfur activity
Derived Values		
% S_{TPA} *	.01	acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	0.50	very little lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H^+ / tonne soil.

** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows medium acidity, which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). There is little to no actual or potential sulfur activity, all of which indicates no actual or potential Acid Sulfate Soil risk.

While this soil is acidic, it has **no actual or potential Acid Sulfate Soil risk.** This soil does not need to be managed as an ASS, and works can proceed without further consideration of ASS. The acidity can be easily managed by incorporating the above small additions of lime.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blundan S and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report
24/01/2007

SPOCAS Profile

CLIENT: **Consulting Earth Scientists**
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: **08/01/2007**

SAMPLE: Batch N°: **2811** Sample N°: **8**
Name: **050107-22-SM**
Test Type: **sPOCAS**

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000 QEC 21650

Sydney Environmental and Soil Laboratory
Specialists in Soil Chemistry, Agronomy and Contamination Assessment

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Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	3.91	extreme acidity
pH in H_2O_2	3.92	extreme acidity
Δ pH unit	-0.01	insignificant pH change
Acidity Trail		
TPA mol H+/t	122	
TAA mol H+/t	62	significant actual acidity
TSA mol H+/t	60	significant potential acidity
Sulphur Trail		
% S_P	.01	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	.01	very slight potential sulfur activity
Derived Values		
% S_{TPA} *	.2	more acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	9.20	some lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H^+ / tonne soil.
** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows extreme acidity, some which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). Upon oxidation the soil shows significant potential acidity combined with very slight sulfur activity which results in a low potential ASS risk.

This soil has **no actual ASS risk** and a **low potential ASS risk**. This can be easily managed by incorporating the above additions of lime, which will neutralise any risk. Once the soil has been treated with lime, it is recommended the soil be resampled to validate the ASS risk has been neutralised.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods Guidelines* Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report
24/01/2007

SPOCAS Profile

CLIENT: **Consulting Earth Scientists**
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: 08/01/2007

SAMPLE: Batch N°: 2811 Sample N°: 9
Name: **050107-24-SM**
Test Type: sPOCAS

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000 QEC 24650

Sydney Environmental and Soil Laboratory

Specialists in Soil Chemistry, Agronomy and Contamination Assessment

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Fax: 02 9484 2427
Em: info@sesl.com.au
Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	4.23	extreme acidity
pH in H_2O_2	3.84	extreme acidity
Δ pH unit	0.39	significant pH drop
Acidity Trail		
TPA mol H+/t	346	
TAA mol H+/t	194	very significant actual acidity
TSA mol H+/t	152	significant potential acidity
Sulphur Trail		
% S_p	.22	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	.22	significant potential sulfur activity
Derived Values		
% S_{TPA} *	.55	more acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	26.00	significant lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H^+ / tonne soil.
** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows extreme acidity, some which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). Upon oxidation the soil shows significant potential acidity combined with significant sulfur activity which results in a medium potential ASS risk.

This soil has **no actual ASS risk and medium potential ASS risk.** This can be easily managed by incorporating the above additions of lime, which will neutralise any risk. Once the soil has been treated with lime, it is recommended the soil be resampled to validate the ASS risk has been neutralised.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998) *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia.

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report 24/01/2007

SPOCAS Profile

CLIENT: **Consulting Earth Scientists**
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: **08/01/2007**

SAMPLE: Batch N°: **2811** Sample N°: **10**
Name: **050107-25-SM**
Test Type: **sPOCAS**

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Sydney Environmental and Soil Laboratory
Specialists in Soil Chemistry, Agronomy and Contamination Assessment

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Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	4.79	very strong acidity
pH in H_2O_2	6.56	slight acidity
Δ pH unit	-1.77	significant pH increase
Acidity Trail		
TPA mol H+/t	< 2	
TAA mol H+/t	26	some actual acidity
TSA mol H+/t	< 2	little to no potential acidity
Sulphur Trail		
% S_p	< 0.01	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	< 0.01	little to no potential sulfur activity
Derived Values		
% S_{TPA} *	< 0.01	
Lime Requirement (kg/tonne) **	0.00	no lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H+ / tonne soil.
** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows very strong to medium acidity, which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). There is little to no actual or potential sulfur activity, all of which indicates no actual or potential Acid Sulfate Soil risk.

While this soil is acidic, it has **no actual or potential Acid Sulfate Soil risk.** This soil does not need to be managed as an ASS, and works can proceed without further consideration of ASS. No lime requirements are necessary.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines: Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia.

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report
24/01/2007

SPOCAS Profile

CLIENT: Consulting Earth Scientists
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: 08/01/2007

SAMPLE: Batch N°: 2811 Sample N°: 11
Name: 050107-26-SM
Test Type: sPOCAS

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000 QEC 21650

Sydney Environmental and Soil Laboratory

Specialists in Soil Chemistry, Agronomy and Contamination Assessment

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Sydney Environmental & Soil Laboratory Pty Ltd
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Fax: 02 9484 2427
Em: info@sesl.com.au
Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	5.50	strong acidity
pH in H_2O_2	5.93	medium acidity
Δ pH unit	-0.43	significant pH increase
Acidity Trail		
TPA mol H+/t	6	
TAA mol H+/t	18	some actual acidity
TSA mol H+/t	< 2	little to no potential acidity
Sulphur Trail		
% S_P	< 0.01	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	< 0.01	little to no potential sulfur activity
Derived Values		
% S_{TPA} *	.01	more acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	0.50	very little lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H^+ / tonne soil.

** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows strong to medium acidity, which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). There is little to no actual or potential sulfur activity, all of which indicates no actual or potential Acid Sulfate Soil risk.

While this soil is acidic, it has **no actual or potential Acid Sulfate Soil risk.** This soil does not need to be managed as an ASS, and works can proceed without further consideration of ASS. The acidity can be easily managed by incorporating the above small additions of lime.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report 24/01/2007

SPOCAS Profile

CLIENT: Consulting Earth Scientists
1/111 Moore St
LEICHHARDT NSW 2040
Attn: Stephen McCormack

PROJECT: Name:
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: 08/01/2007

SAMPLE: Batch N°: 2811 Sample N°: 12
Name: 060107-27-SM
Test Type: sPOCAS

Quality System
Quality Endorsed Company
AS/NZS ISO 9001:2000 QEC 21650

Sydney Environmental and Soil Laboratory

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Fax: 02 9484 2427
Em: info@sesl.com.au
Web: www.sesl.com.au

TEST	RESULT	COMMENTS
pH in KCl	4.42	extreme acidity
pH in H_2O_2	4.21	extreme acidity
Δ pH unit	0.21	slight pH drop
Acidity Trail		
TPA mol H+/t	34	
TAA mol H+/t	22	some actual acidity
TSA mol H+/t	12	little potential acidity
Sulphur Trail		
% S_P	< 0.01	
% S_{KCl}	< 0.01	little to no actual sulfur activity
% S_{POS}	< 0.01	little to no potential sulfur activity
Derived Values		
% S_{TPA} *	.05	acidity from a non-pyrite source
Lime Requirement (kg/tonne) **	2.60	little lime requirements

* TPA equivalent S%, where 1% sulphide produces 623.7 mole H^+ / tonne soil.

** Includes a safety factor of 1.5.

Recommendations

For the purpose of Acid Sulfate Soil (ASS) assessment as per the Acid Sulfate Soil Manual (ASSMAC), this soil shows extreme acidity, which is due to a non-pyrite source (e.g. organic matter, Mn compounds and ferrolysis). There is little to no actual or potential sulfur activity, all of which indicates no actual or potential Acid Sulfate Soil risk.

While this soil is extremely acidic, it has **no actual or potential Acid Sulfate Soil risk**. This soil does not need to be managed as an ASS, and works can proceed without further consideration of ASS. The extreme acidity can be easily managed by incorporating the above additions of lime.

If you have any questions or would like to discuss these results please call myself at the office on 9980 6554.

Explanation of the Methods:
Ahern CR, Blunden B and Stone Y (eds.) (1998). *Acid Sulphate Soils Laboratory Methods* Guidelines Published by the Acid Sulphate Soil Management Advisory committe, Wollongbar, NSW, Australia

Checked by ..... Simon Leake

Consultant ..... Stacy Crook

Date of Report
24/01/2007

Batch # 20111-12 Client # 3032

Phone: (02) 9449 0111 **AGAL NSW CHAIN OF CUSTODY FORM** Fax: (02) 9449 1653

From: CONSULTING EARTH SCIENTISTS (STEVE McCormack)

Address: 1/111 MOORE ST LEICHHARDT NSW
(for results & invoice)

Fax: 9550 9566 Phone: 8585 4888 Mobile: 0413 601 751

Email: smccorm@consultingearth.com.au Requested by: SMC Date: 8/1/2007

To: [redacted] SYDNEY ENVIRONMENTAL & SOIL LABORATORY
~~1 Station Street (PO Box 685)~~
~~PYMBLE NSW 2073~~
16 CHILVERS RD
THORNLEIGH 2120

Attention:

AGAL QUOTE No.:

RESULTS REQUIRED BY: / /

AGAL NSW SAMPLE NUMBERS	CLIENT REFERENCE	SAMPLE DESCRIPTION	TESTS REQUIRED	NOTES & COMMENTS
1	040107-01-SM	FROZEN SOIL	5 DOCAS	
2	040107-03-SM	"	"	
3	040107-06-SM	"	"	
4	040107-09-SM	"	"	
5	040107-13-SM	"	"	
6	040107-~~15~~ 02 SM	"	"	
7	050107-20-SM	"	"	
8	050107-22-SM	"	"	
9	050107-24-SM	"	"	
10	050107-25-SM	"	"	
11	050107-26-SM	"	"	
12	050107-27-SM	"	"	

Signature of person submitting samples: J. R. Hook

(Laboratory use only)
Received by: Date: / /
Print Name: Time:

NOTE: All work is accepted subject to AGAL'S Terms & Conditions.

SM emailed 08/01/07 DL

AUSTRALIAN SOIL TESTING PTY LTD. A.B.N. 79 003 193 823
19 Bermill Street, Rockdale, NSW, 2216 P.O. Box 2014, Rockdale D.C. NSW 2216
Tel: 9597 5599, 9597 3286 Fax: 9597 3442 Email: austst@bigpond.com

SOIL CLASSIFICATION TEST DATA

CLIENT: **Consulting Earth Scientists**
Unit 1/ 111 Moore Street Leichhardt NSW 2040

PROJECT: **58 Tongarra Road Albion Park NSW CES060714-AM**

LAB. NO.	SAMPLE SOURCE	SAMPLE DESCRIPTION	MOISTURE CONTENT (%) 1	DRY DENSITY (t/m^3)	LIQUID LIMIT 2	PLASTIC INDEX 3	LINEAR SHRINKAGE (%) 4
41159	TP4 0.5-1.0m	SILTY CLAY: brown, medium plasticity, trace of fine sand.	21.5	-	47	24	12.0
41160	TP1 0.5-1.0m	SILTY CLAY: brown, high plasticity, trace of fine sand.	21.5	-	60	40	16.5
41161	TP1 1.3-1.6m	SILTY CLAY: brown, high plasticity, trace of fine sand.	12.4	-	-	-	-
41162	TP5 0.4-1.0m	SILTY CLAY: brown, high plasticity, trace of fine sand and fine gravel.	24.4	-	70	49	18.5
41163	TP8 0.3-1.0m	SILTY CLAY: brown, high plasticity, trace of fine sand and fine gravel.	28.4	-	75	46	16.5
41164	TP10 0.3-0.7m	SANDY CLAY/ CLAYEY SAND: brown, low plasticity, fine to coarse sand, with fine to medium gravel.	9.9	-	29	15	8.5
41165	TP10 1.2-1.5m	SILTY CLAY: brown, high plasticity, trace of fine to medium sand and fine gravel.	15.0	-	46	27	12.0
41166	TP11 0.4-0.8m	SILTY CLAY: brown, high plasticity, trace of fine sand.	36.0	-	89	59	20.5

NOTES TO TESTING

1 Test method: AS 1289 2.1.1-1992
2 Test Method: AS 1289 3.1.2
Preparation: natural state with no sieving
Sample History: natural state as received
3 Test Method: AS 1289 3.2.1, 3.3.1
Preparation and sample history as 2.
4 Test Method: AS 1289 3.4.1
Sample history and preparation as 2.
Mould size: 125mm
Dry state: linear.

Sampled by: CES

Job Number: 133-023

Date Tested: 12.1.07

Form C01 excel issue 4 Jan 1997 CWS

Signed: ..... Name: C. Lloyd

Title: LM Date: 25/1/07

AUSTRALIAN SOIL TESTING PTY LTD. A.B.N. 79 003 493 623
19 Bermill Street, Rockdale, NSW, 2216 P.O. Box 2014, Rockdale D.C. NSW 2216
Tel: 9597 5599, 9597 3286 Fax: 9597 3442 Email: austst@bigpond.com

CALIFORNIA BEARING RATIO TEST REPORT

CLIENT: **Consulting Earth Scientists**
1/111 Moore Street Leichhardt NSW 2040

PROJECT: **58 Tongarra Road Albion Park CES 060714-AM**

SAMPLE SOURCE	TP4 0.5-1.0m	
SAMPLE DESCRIPTION	SILTY CLAY: brown, medium plasticity, trace of fine sand.	
LABORATORY NUMBER	41159	
	SOAKED	
CBR VALUE @ 2.5mm	5	
@ 5.0mm	6	
SAMPLE DATA		
Compaction Specification	100% of MDD @ OMC	
Maximum Dry Density (MDD)	1.52	t/m^3
Optimum Moisture Content (OMC)	24.0	%
Surcharge	4.5	kg
No of days soaked	4	
SAMPLE PREPARATION		
TEST DATA		
Dry Density - before soaking	1.52	t/m^3
- after soaking	1.51	t/m^3
Density Ratio - before soaking	100.1	%
- after soaking	99.2	%
Moisture Content - before soaking	23.3	%
(before test) - after soaking	27.5	%
Moisture Content - top 30mm	30.0	%
(after test) - whole sample	26.7	%
Swell after soaking	0.9	%
COMPACTIVE EFFORT	Standard	
Number of layers	3	
Blows per layer	53	
Mass of rammer	2.7	kg
Drop of rammer	300	mm

COMMENTS

% mass retained on 19 mm sieve: 0

Sampled By: Client
Date Tested: 23.1.07

Tested in accordance with AS1289.6.1.1 Determination of the California Bearing Ratio of a soil - Standard Laboratory Method for a remoulded specimen.

Form ED3 excel Issue 2 August 1998 CWS

Signed: ..... Name: C. Hoyd

Title: LM Date: 25/1/07

AUSTRALIAN SOIL TESTING PTY LTD. A.B.N. 79 003 493 623
19 Bermill Street, Rockdale, NSW, 2216 P.O. Box 2014, Rockdale D.C. NSW 2216
Tel: 9597 5599, 9597 3286 Fax: 9597 3442 Email: austst@bigpond.com

CALIFORNIA BEARING RATIO TEST REPORT

CLIENT: **Consulting Earth Scientists**
1/111 Moore Street Leichhardt NSW 2040

PROJECT: **58 Tongarra Road Albion Park CES 060714-AM**

SAMPLE SOURCE	TP1 0.5-1.0m	
SAMPLE DESCRIPTION	SILTY CLAY: brown, high plasticity, trace of fine sand.	
LABORATORY NUMBER	41160	
	SOAKED	
CBR VALUE @ 2.5mm	4	
@ 5.0mm	3.5	
SAMPLE DATA		
Compaction Specification	100% of MDD @ OMC	
Maximum Dry Density (MDD)	1.64	t/m^3
Optimum Moisture Content (OMC)	22.0	%
Surcharge	4.5	kg
No of days soaked	4	
SAMPLE PREPARATION		
TEST DATA		
Dry Density - before soaking	1.64	t/m^3
- after soaking	1.63	t/m^3
Density Ratio - before soaking	100.2	%
- after soaking	99.3	%
Moisture Content - before soaking	22.0	%
(before test) - after soaking	22.9	%
Moisture Content - top 30mm	25.7	%
(after test) - whole sample	23.9	%
Swell after soaking	0.9	%
COMPACTIVE EFFORT	Standard	
Number of layers	3	
Blows per layer	53	
Mass of rammer	2.7	kg
Drop of rammer	300	mm

COMMENTS

% mass retained on 19 mm sieve: 0

Sampled By: Client
Date Tested: 23.1.07

Tested in accordance with AS1289.6.1.1 Determination of the California Bearing Ratio of a soil - Standard Laboratory Method for a remoulded specimen.

Form E03 excel Issue 2 August 1998 CWS

Signed: ..... Name: C. Lloyd
Title: LM Date: 25/1/07

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CALIFORNIA BEARING RATIO TEST REPORT

CLIENT: **Consulting Earth Scientists**
1/111 Moore Street Leichhardt NSW 2040

PROJECT: **58 Tongarra Road Albion Park CES 060714-AM**

SAMPLE SOURCE	TP1 1.3-1.6m	
SAMPLE DESCRIPTION	Shale	
LABORATORY NUMBER	41161	
	SOAKED	
CBR VALUE @ 2.5mm	6	
@ 5.0mm	7	
SAMPLE DATA		
Compaction Specification	100% of MDD @ OMC	
Maximum Dry Density (MDD)	1.60	t/m^3
Optimum Moisture Content (OMC)	12.0	%
Surcharge	4.5	kg
No of days soaked	4	
SAMPLE PREPARATION		
TEST DATA		
Dry Density - before soaking	1.62	t/m^3
- after soaking	1.60	t/m^3
Density Ratio - before soaking	101.1	%
- after soaking	100.1	%
Moisture Content - before soaking	12.1	%
(before test) - after soaking	20.8	%
Moisture Content - top 30mm	21.0	%
(after test) - whole sample	21.0	%
Swell after soaking	1.0	%
COMPACTIVE EFFORT	Standard	
Number of layers	3	
Blows per layer	53	
Mass of rammer	2.7	kg
Drop of rammer	300	mm

COMMENTS

% mass retained on 19 mm sieve: 0

Sampled By: Client
Date Tested: 23.1.07

Tested in accordance with AS1289.6.1.1 Determination of the California Bearing Ratio of a soil - Standard Laboratory Method for a remoulded specimen.

Form E03 excel issue 2 August 1998 CWS

Signed: ..... Name: E. Lloyd
Title: Lab Manager Date: 25/1/07

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CALIFORNIA BEARING RATIO TEST REPORT

CLIENT: **Consulting Earth Scientists**
1/111 Moore Street Leichhardt NSW 2040

PROJECT: **58 Tongarra Road Albion Park CES 060714-AM**

SAMPLE SOURCE	TP5 0.4-1.0m	
SAMPLE DESCRIPTION	SILTY CLAY: brown, high plasticity, trace of fine sand and fine gravel.	
LABORATORY NUMBER	41162	
	SOAKED	
CBR VALUE @ 2.5mm	3	
@ 5.0mm	2.5	
SAMPLE DATA		
Compaction Specification	100% of MDD @ OMC	
Maximum Dry Density (MDD)	1.49	t/m^3
Optimum Moisture Content (OMC)	26.0	%
Surcharge	4.5	kg
No of days soaked	4	
SAMPLE PREPARATION		
TEST DATA		
Dry Density - before soaking	1.50	t/m^3
- after soaking	1.49	t/m^3
Density Ratio - before soaking	100.6	%
- after soaking	99.8	%
Moisture Content - before soaking	25.0	%
(before test) - after soaking	32.5	%
Moisture Content - top 30mm	32.8	%
(after test) - whole sample	31.5	%
Swell after soaking	0.8	%
COMPACTIVE EFFORT	Standard	
Number of layers	3	
Blows per layer	53	
Mass of rammer	2.7	kg
Drop of rammer	300	mm

COMMENTS

% mass retained on 19 mm sieve: 0

Sampled By: Client
Date Tested: 23.1.07

Tested in accordance with AS1289.6.1.1 Determination of the California Bearing Ratio of a soil - Standard Laboratory Method for a remoulded specimen.

Form ED3 excel issue 2 August 1998 CWS

Signed: .....
Title: LAB

Name: S. Hoyd
Date: 25/1/07

AUSTRALIAN SOIL TESTING PTY LTD. A.B.N. 79 003 493 623
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CALIFORNIA BEARING RATIO TEST REPORT

CLIENT: **Consulting Earth Scientists**
1/111 Moore Street Leichhardt NSW 2040

PROJECT: **58 Tongarra Road Albion Park CES 060714-AM**

SAMPLE SOURCE	TP8 0.3-1.0m	
SAMPLE DESCRIPTION	SILTY CLAY: brown, high plasticity, trace of fine sand and fine gravel.	
LABORATORY NUMBER	41163	
	SOAKED	
CBR VALUE @ 2.5mm	0.5	
@ 5.0mm	0.5	
SAMPLE DATA		
Compaction Specification	100% of MDD @ OMC	
Maximum Dry Density (MDD)	1.35	t/m^3
Optimum Moisture Content (OMC)	20.5	%
Surcharge	4.5	kg
No of days soaked	4	
SAMPLE PREPARATION		
TEST DATA		
Dry Density - before soaking	1.36	t/m^3
- after soaking	1.34	t/m^3
Density Ratio - before soaking	100.9	%
- after soaking	99.1	%
Moisture Content - before soaking	20.0	%
(before test) - after soaking	40.0	%
Moisture Content - top 30mm	42.3	%
(after test) - whole sample	37.7	%
Swell after soaking	1.8	%
COMPACTIVE EFFORT	Standard	
Number of layers	3	
Blows per layer	53	
Mass of rammer	2.7	kg
Drop of rammer	300	mm

COMMENTS

% mass retained on 19 mm sieve: 0

Sampled By: Client
Date Tested: 23.1.07

Tested in accordance with AS1289.6.1.1 Determination of the California Bearing Ratio of a soil - Standard Laboratory Method for a remoulded specimen.

Form E03 excel Issue 2 August 1998 CWS

Signed: ..... Name: C. Lloyd
Title: Lab Tech Date: 25/1/07

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CALIFORNIA BEARING RATIO TEST REPORT

CLIENT: **Consulting Earth Scientists**
1/111 Moore Street Leichhardt NSW 2040

PROJECT: **58 Tongarra Road Albion Park CES 060714-AM**

SAMPLE SOURCE	TP10 0.3-0.7m	
SAMPLE DESCRIPTION	SANDY CLAY/ CLAYEY SAND: brown, low plasticity, fine to coarse sand, with fine to medium gravel.	
LABORATORY NUMBER	41164	
	SOAKED	
CBR VALUE @ 2.5mm	5.5	
@ 5.0mm	5	
SAMPLE DATA		
Compaction Specification	100% of MDD @ OMC	
Maximum Dry Density (MDD)	1.88	t/m^3
Optimum Moisture Content (OMC)	11.5	%
Surcharge	4.5	kg
No of days soaked	4	
SAMPLE PREPARATION		
TEST DATA		
Dry Density - before soaking	1.88	t/m^3
- after soaking	1.84	t/m^3
Density Ratio - before soaking	99.9	%
- after soaking	98.1	%
Moisture Content - before soaking	11.2	%
(before test) - after soaking	16.2	%
Moisture Content - top 30mm	17.0	%
(after test) - whole sample	15.6	%
Swell after soaking	1.8	%
COMPACTIVE EFFORT	Standard	
Number of layers	3	
Blows per layer	53	
Mass of rammer	2.7	kg
Drop of rammer	300	mm

COMMENTS

% mass retained on 19 mm sieve: 0

Sampled By: Client
Date Tested: 23.1.07

Tested in accordance with AS1289.6.1.1 Determination of the California Bearing Ratio of a soil - Standard Laboratory Method for a remoulded specimen.

Form E03 excel issue 2 August 1998 CWS

Signed: ..... Name: C. Lloyd

Title: LM Date: 25/1/07

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CALIFORNIA BEARING RATIO TEST REPORT

CLIENT: **Consulting Earth Scientists**
1/111 Moore Street Leichhardt NSW 2040

PROJECT: **58 Tongarra Road Albion Park CES 060714-AM**

SAMPLE SOURCE	TP11 0.4-0.8m	
SAMPLE DESCRIPTION	SILTY CLAY: brown, high plasticity, trace of fine sand.	
LABORATORY NUMBER	41166	
	SOAKED	
CBR VALUE @ 2.5mm	0.5	
@ 5.0mm	0.5	
SAMPLE DATA		
Compaction Specification	100% of MDD @ OMC	
Maximum Dry Density (MDD)	1.28	t/m^3
Optimum Moisture Content (OMC)	19.0	%
Surcharge	4.5	kg
No of days soaked	4	
SAMPLE PREPARATION		
TEST DATA		
Dry Density - before soaking	1.26	t/m^3
- after soaking	1.23	t/m^3
Density Ratio - before soaking	98.0	%
- after soaking	95.8	%
Moisture Content - before soaking	21.7	%
(before test) - after soaking	47.8	%
Moisture Content - top 30mm	49.5	%
(after test) - whole sample	43.3	%
Swell after soaking	2.4	%
COMPACTIVE EFFORT	Standard	
Number of layers	3	
Blows per layer	53	
Mass of rammer	2.7	kg
Drop of rammer	300	mm

COMMENTS
% mass retained on 19 mm sieve: 0

Sampled By: Client
Date Tested: 23.1.07

Tested in accordance with AS1289.6.1.1 Determination of the California Bearing Ratio of a soil - Standard Laboratory Method for a remoulded specimen.

Form E03 (excel latun 2 August 1998 CWS

Signed: ..... Name: C. Lloyd
Title: LM Date: 25/1/07

AUSTRALIAN SOIL TESTING PTY LTD. A.B.N. 79 003 483 623
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Tel: 9597 5599, 9597 3286 Fax: 9597 3442 Email: austst@bigpond.com

PINHOLE DISPERSION CLASSIFICATION

CLIENT: **Consulting Earth Scientists**
Unit 1/ 111 Moore Street Leichhardt NSW 2040

PROJECT: **58 Tongarra Road Albion Park NSW CES060714-AM**

LAB. NO.	SAMPLE SOURCE	SAMPLE DESCRIPTION	NATURAL MC (%)	MAXIMUM DRY DENSITY (t/m^3)	TEST MC (%)	TEST DRY DENSITY (t/m^3)	PINHOLE DISPERSION CLASSIFICATION
41160	TP1 0.5-1.0m	SILTY CLAY: brown, high plasticity, trace of fine sand.	21.5	1.64	20.0	1.56	PD2
41161	TP1 1.3-1.6m	SILTY CLAY: brown, high plasticity, trace of fine sand.	12.4	1.60	21.5	1.52	ND1
41163	TP8 0.3-1.0m	SILTY CLAY: brown, high plasticity, trace of fine sand and fine gravel.	28.4	1.35	29.0	1.28	ND1
41164	TP10 0.3-0.7m	SANDY CLAY/ CLAYEY SAND: brown, low plasticity, fine to coarse sand, with fine to medium gravel.	9.9	1.88	14.0	1.79	ND1
41166	TP11 0.4-0.8m	SILTY CLAY: brown, high plasticity, trace of fine sand.	36.0	1.28	30.0	1.22	ND1

NOTES TO TESTING

Test Procedure: AS1289 3.8.3 Determination of pinhole dispersion classification of a soil.

Time to Cure Sample: 24 Hours.

Source of water: Distilled water.

Sampled by: CES

Job Number: 133-023

Date Tested: 25.1.07

Comments:

Form C09 excel issue 2 July 2001 CWS

Signed: ..... Name: C. Lloyd.....
Title: LM Date: 25/1/07

SAMPLE RECEIPT ADVICE

Client: Consulting Earth Scientists
1/111 Moore St
LEICHHARDT NSW 2040

Attn: Stephen McCormack

Job N°:

Order N°:

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000 QEC 21650

Sydney Environmental and Soil Laboratory
Specialists in Soil Chemistry, Agronomy and Contamination Assessments

Sydney Environmental & Soil Laboratory Pty Ltd
ABN 70 105 810 708
16 Chilvers Road
Thornleigh NSW 2120
Australia
Address mail to:
PO Box 357
Pennant Hills NSW 1715
Tel: 02 9980 6554
Fax: 02 9484 2427
Em: info@sesl.com.au
Web: www.sesl.com.au

Project:

Date Samples Rec'd: 08/01/2007
Sample Receipt Contact: Lyndall Salli
Requested Turnaround Time: Normal
Expected Report Date: 23/01/2007

SESL Job N°:
SESL Batch N°: 2811
Reporting Format: ☒ Mail ☐ Email PDF ☒ Fax ☐ Phone ☐ Email Excel

Reporting Method: Results, interpretations & rec's
Reporting Contact: Stacy Crook

Please read this receipt carefully. If there are any discrepancies to expected testwork - notify laboratory immediately

Comments:

Sample N°: 1	Name: 040107-01-SM	Description:	Type: Soil	Test Type: sPOCAS	Samples received in adequate condition: ◉Y ○N ○N/A Sufficient sample quantity received for analysis: ◉Y ○N ○N/A Sample preservation method satisfactory: ◉Y ○N ○N/A Sample Temperature: °C Adequate documentation received: ◉Y ○N ○N/A Health Risk: ○Y ◉N ○N/A
Sample N°: 2	Name: 040107-03-SM	Description:	Type: Soil	Test Type: sPOCAS	Samples received in adequate condition: ◉Y ○N ○N/A Sufficient sample quantity received for analysis: ◉Y ○N ○N/A Sample preservation method satisfactory: ◉Y ○N ○N/A Sample Temperature: °C Adequate documentation received: ◉Y ○N ○N/A Health Risk: ○Y ◉N ○N/A
Sample N°: 3	Name: 040107-06-SM	Description:	Type: Soil	Test Type: sPOCAS	Samples received in adequate condition: ◉Y ○N ○N/A Sufficient sample quantity received for analysis: ◉Y ○N ○N/A Sample preservation method satisfactory: ◉Y ○N ○N/A Sample Temperature: °C Adequate documentation received: ◉Y ○N ○N/A Health Risk: ○Y ◉N ○N/A
Sample N°: 4	Name: 040107-09-SM	Description:	Type: Soil	Test Type: sPOCAS	Samples received in adequate condition: ◉Y ○N ○N/A Sufficient sample quantity received for analysis: ◉Y ○N ○N/A Sample preservation method satisfactory: ◉Y ○N ○N/A Sample Temperature: °C Adequate documentation received: ◉Y ○N ○N/A Health Risk: ○Y ◉N ○N/A
Sample N°: 5	Name: 040107-13-SM	Description:	Type: Soil	Test Type: sPOCAS	Samples received in adequate condition: ◉Y ○N ○N/A Sufficient sample quantity received for analysis: ◉Y ○N ○N/A Sample preservation method satisfactory: ◉Y ○N ○N/A Sample Temperature: °C Adequate documentation received: ◉Y ○N ○N/A Health Risk: ○Y ◉N ○N/A
Sample N°: 6	Name: 040107-02-SM	Description:	Type: Soil	Test Type: sPOCAS	Samples received in adequate condition: ◉Y ○N ○N/A Sufficient sample quantity received for analysis: ◉Y ○N ○N/A Sample preservation method satisfactory: ◉Y ○N ○N/A Sample Temperature: °C Adequate documentation received: ◉Y ○N ○N/A Health Risk: ○Y ◉N ○N/A

Printed: 08/01/2007

Sample Receipt Advice — Sydney Environmental & Soil Laboratory Pty Ltd ABN 70 106 610 706

Client: Consulting Earth Scientists
Attn: Stephen McCormack
Project:

Job N°:
Order N°:
SESL Job N°:
SESL Batch N°: 2811

Sample N°: 7		Samples received in adequate condition:	◉ Y	○ N	○ N/A
Name: 050107-20-SM		Sufficient sample quantity received for analysis:	◉ Y	○ N	○ N/A
Description:		Sample preservation method satisfactory:	◉ Y	○ N	○ N/A
Type: Soil		Sample Temperature:		°C	
Test Type: sPOCAS		Adequate documentation received:	◉ Y	○ N	○ N/A
		Health Risk:	○ Y	◉ N	○ N/A
Sample N°: 8		Samples received in adequate condition:	◉ Y	○ N	○ N/A
Name: 050107-22-SM		Sufficient sample quantity received for analysis:	◉ Y	○ N	○ N/A
Description:		Sample preservation method satisfactory:	◉ Y	○ N	○ N/A
Type: Soil		Sample Temperature:		°C	
Test Type: sPOCAS		Adequate documentation received:	◉ Y	○ N	○ N/A
		Health Risk:	○ Y	◉ N	○ N/A
Sample N°: 9		Samples received in adequate condition:	◉ Y	○ N	○ N/A
Name: 050107-24-SM		Sufficient sample quantity received for analysis:	◉ Y	○ N	○ N/A
Description:		Sample preservation method satisfactory:	◉ Y	○ N	○ N/A
Type: Soil		Sample Temperature:		°C	
Test Type: sPOCAS		Adequate documentation received:	◉ Y	○ N	○ N/A
		Health Risk:	○ Y	◉ N	○ N/A
Sample N°: 10		Samples received in adequate condition:	◉ Y	○ N	○ N/A
Name: 050107-25-SM		Sufficient sample quantity received for analysis:	◉ Y	○ N	○ N/A
Description:		Sample preservation method satisfactory:	◉ Y	○ N	○ N/A
Type: Soil		Sample Temperature:		°C	
Test Type: sPOCAS		Adequate documentation received:	◉ Y	○ N	○ N/A
		Health Risk:	○ Y	◉ N	○ N/A
Sample N°: 11		Samples received in adequate condition:	◉ Y	○ N	○ N/A
Name: 050107-26-SM		Sufficient sample quantity received for analysis:	◉ Y	○ N	○ N/A
Description:		Sample preservation method satisfactory:	◉ Y	○ N	○ N/A
Type: Soil		Sample Temperature:		°C	
Test Type: sPOCAS		Adequate documentation received:	◉ Y	○ N	○ N/A
		Health Risk:	○ Y	◉ N	○ N/A
Sample N°: 12		Samples received in adequate condition:	◉ Y	○ N	○ N/A
Name: 050107-27-SM		Sufficient sample quantity received for analysis:	◉ Y	○ N	○ N/A
Description:		Sample preservation method satisfactory:	◉ Y	○ N	○ N/A
Type: Soil		Sample Temperature:		°C	
Test Type: sPOCAS		Adequate documentation received:	◉ Y	○ N	○ N/A
		Health Risk:	○ Y	◉ N	○ N/A

Printed: 08/01/2007

Client: Consulting Earth Scientists
Attn: Stephen McCormack
Project:

Job N°:
Order N°:
SESL Job N°:
SESL Batch N°: 2811

Key to Test Type Codes:

Disp: Dispersability
ASS: Acid Sulphate Screen
AFP/WHC: Air Filled porosity / Water Holding Capacity
BD: Bulk Density
CW 1-CW4: Cricket Wicket Package 1-4
DC: Drop cone
EAT: Emerson Aggregate Test
HC@1pt: Hydraulic conductivity @ 1pt
HCCC: Hydraulic conductivity curve
LV/ANC: Liming value/Acid Neutralising Capacity
LOI: Loss on Ignition
mEAT: modified Emerson Aggregate Test
MC: Moisture Content
NAGC: Net Acid Generating capacity
NDI: Nitrogen Drawdown Index
Olsen: Olsen Extractable Phosphorus
OM: Organic Matter
PSA : Particle Size Analysis (and Method)
PSA s+c: Particle Size Analysis / silt + clay

Perm: Permeability, **Struc:** Structure
Text: Texture
TC: Total Carbon
TN: Total Nitrogen
TS: Total Sulphur
TSS: Total Suspended Solids
Tox: Toxicity
WHC@1pt: Water Holding capacity @1pt
MRC: Moisture Release Curve
WBD: Wax Block Density
Wett: Wettability
BS: Basic Soil
MS: Major Soil,
FS: Full Soil
SS : Sub Soil
FF: Full Foliar
BW: Basic Water
MW: Major Water
FW: Full Water,

BM: Basic Media
MM: Major Media
FM: Full Media
CSAW: Corrosion and Scaling for Water
CSAS: Corrosion and Scaling for Soil
eCEC: Cation exchange Capacity (solubles and exchangables)
ECEC: Cation exchange Capacity (solubles only)
AS3743 (P or R): Aust. Standard - Potting Mixes Premium or Regular
AS4454 CSC: Aust. Standard - Composted Soil Conditioner
AS4454 CM: Aust. Standard - Composted Mulch
AS4454 PSC: Aust. Standard - Pasteurised Soil Conditioner / Fine Mulch
AS4454 PM: Aust. Standard - Pasteurised Mulch
AS4419 LD: Aust. Standard - Low Density Soil
AS4419 OS: Aust. Standard - Organic Soil
AS4419 NS: Aust. Standard - Natural Soil or Soil Blend
AS4419 TD: Aust. Standard - Top Dressing
LP1-LP7: Landscape Package 1 - Landscape Package 7
Bunker: Bunker Sand Package
EFF single: Effluent Package single dwelling
EFF sub: Effluent Package subdivision

SAMPLES RECEIVED - TERMS AND CONDITIONS

Analysis Requests - Before performing any work, SESL reviews client's analysis request document(s) and the completed Job Control Sheet (JCS) that outlines the scope and timing of the work to be performed. If such request is unclear or if the JCS is incomplete, SESL consults with the client before proceeding. In all situations, the client must provide a commercially acceptable order prior to SESL initiating the requested services.

Method Selection - SESL aims to conduct analysis requested by the client using the most appropriate method for the client's purpose. The Sample Receipt Advice advises the client of the method being used and issued reports will reference the method used for analysis. The method requested by the client will supersede SESL method selection procedure. SESL will notify client if the method requested is inappropriate or out of date. The method selection protocol, method correlation information or the method procedure can be obtained from SESL on request.

Turnaround Time - Standard analysis service is provided in approximately 10 working days from the date of sample receipt. Deliveries are accepted from 8:00 a.m. to 4:30 p.m. Samples received prior to 1:00 p.m. are processed that day, samples received after 1:00 p.m. are processed the next business day. Turnaround time less than standard is available per client request, subject to negotiation and priority and urgent service conditions. Analysis completion time varies with the sample type, handling requirements and the tests requested.

Priority and Urgent Service - A priority or urgent service charge is added to the standard price when a rush analysis is requested. Priority and Urgent days are counted in business days unless otherwise noted in the quote. Priority and urgent charge day begins no later than 10:00 a.m., otherwise 8:00 a.m. the following morning. Priority and urgent charges are 50% and 100% of the standard analysis cost respectively.

Repeat Analysis - If a client requests a repeat analysis and the results confirm the original analysis, the client is charged for the repeat analysis. If the original results are not confirmed, the client is not charged for the additional work.

Reports - All reports are issued in a clear and concise Analysis Report. The standard Analysis Report is a paper document and is delivered to customers primary business address. Standard delivery methods of reporting include; mail through Australia Post, faxing or emailing. Custom reports can be generated for an additional charge to meet client needs. Client must specify non-standard delivery method of reports prior to analysis completion.

Records - All records and supporting documentation remain the property of SESL and are retained for a period of five (5) years after the work has been completed. After this period, documents and computer based files may be destroyed. However, alternative retention arrangements can be made by the client at client expense.

Sample Retention Period - Unless prior arrangements are made, any portion of samples not used for analysis is held for a maximum of 90 days after delivery of analysis results. All samples are disposed of in an appropriate manner.

Any samples found to be or suspected of being hazardous are returned to the client at the client's expense. Alternatively SESL may arrange disposal of suspected hazardous samples per client's request. The client retains ownership of all samples submitted to SESL for analysis, storage and/or disposal.

Prices and Discounts - Current test prices are communicated to the client via quotes and pricelist. Quotes are valid for the period stated on the quote and are null and void after said period. If no period is stated, such quotes expire 30 days after document date. Current test prices are subject to change without notice. Unless specifically agreed to otherwise, the minimum laboratory service fee is $50.00 ex GST. Some methodologies may require an initial method setup charge, regardless of the number of samples.

Volume discounts may be offered bas ed upon a guaranteed work level. This may be structured on a project by project, or an annual contract basis. All discounts are contingent on meeting agreed payment terms and conditions. SESL reserves the right to suspend discounts due to late client payments.

Project Cancellations - When a client cancels services and/or testing for received samples, all preparatory work that has been completed up to the cancellation point is invoiced to the client plus all costs associated with procurement of client- specific materials.

Payment Terms - Our current Provision of Service Agreement applies to all works conducted by SESL. Payment terms are cash on delivery for all new clients except those who have been granted trade credit by SESL. Upon trade credit approval,SESL's standard payment terms are net 7 days with no prompt pay discounts allowed. A 1.5% per month interest charge is added to all unpaid balances. There is a $30.00 ex GST charge for returned cheques. At our discretion, we may request payment with order, and withhold results until payment has been received.

Confidentiality - SESL maintains strict confidentiality of all client information. Results or other information regarding client work is not released to any party other than the client, unless the client requests – in writing – information be provided to a third party or unless disclosure by SESL is required by law. Formal confidentiality agreements will be executed upon client request.

Warranty and Limits of Liability - SESL makes the best effort to deliver the most precise measurements but we will not assume any legal or other responsibility for erroneous results. SESL's warranty is limited to the accuracy of analyses of samples as received. SESL assumes no responsibility for the purposes for which the client uses the test results, nor liability for any other warranties, expressed or implied, including warranties of fitness for a particular purpose or for merchantability made by the client. These terms supercede any conflicting terms and conditions stated on any purchase order, or other order of work submitted by the client.

Additional Fees and Legal Costs - By submitting samples for analysis, the client agrees that our analysis fees do not include the cost of any additional or incidental services that may be associated with such samples or the analytical results thereof. Cost of additional or incidental service efforts are billed to, and paid by, the client.

END OF DOCUMENT

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