Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

A.B.N. 17 003 550 801 A.C.N. 003 550 801

Principals
B F WALKER BE DIC MSc
P STUBBS BSc MICE FGS
D TREWEEK Dip Tech
E H FLETCHER BSc (Eng) ME

Senior Associates
F A VEGA BSc(Eng) GDE
A ZENON BSc(Eng) GDE
P C WRIGHT BE(Hons) MEngSc
L J SPEECHLEY BE(Hons) MEngSc

Associates
A B WALKER BE(Hons) MEngSc

Consultant
R P JEFFERY BE DIC MSc

39 BUFFALO ROAD
GLADESVILLE
NSW 2111
Tel: 02-9809 7322
02-9807 0200
Fax: 02-9809 7626

REPORT

TO

NSW DEPARTMENT OF COMMERCE

ON

GEOTECHNICAL INVESTIGATION

FOR

PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

AT

LIVERPOOL, NSW

13 July 2006 **Ref: M20303ZArpt**

TABLE OF CONTENTS

Table A: Summary of Laboratory Test Results
Table B: Summary of Point Load Strength Index Test Results

Borehole Logs 1001, 1002, 1003, 1003A, 1004 to 1008
(Including Colour Rock Core Photographs)

Figure 1: Borehole Location Plan

Appendix A: Borehole Logs and Borehole Location Plan from Previous Report, Ref: 7088K dated 13 October 1989
Appendix B: Borehole Logs and Borehole Location Plan from Previous Report, Ref: 7104J dated 2 November 1989
Appendix C: Borehole Logs and Borehole Location Plan from Previous Report, Ref: 8471W dated November 1991
Appendix D: Borehole Logs and Borehole Location Plan from Previous Report, Ref: 9014W dated 11 August 1992
Appendix E: Borehole Logs and Borehole Location Plan from Previous Report, Ref: 9597WD dated 30 June 1993
Appendix F: Borehole Logs and Borehole Location Plans from Previous Reports, Ref: M17359WA dated 3 September 2003, Ref: M17359WA2 dated 10 December 2003, and Ref: M17359WA4 dated 16 July 2004
Appendix G: Relevant Borehole Logs and Borehole Location Plan from Previous Report, Ref: M17485WZA dated 24 April 2003
Appendix H: Summary of Soil Sulphate, Chloride and pH Test Results (LabPoint Pty Ltd)

Report Explanation Notes

1 INTRODUCTION

This report presents the results of a geotechnical investigation for the proposed Liverpool Hospital Redevelopment Project. The investigation was commissioned by Mr Lou Fantini of NSW Department of Commerce (DoC) by letter dated 18 May 2006 (RFT/Contract No. 0601164). The commission was on the basis of our fee proposal, Ref: PM327ZA (Non-Conforming Tender) dated 9 May 2006.

For the purpose of this report, we have referred to the hospital area on the western side of the Main Southern Railway as the "western hospital grounds", and the hospital area on the eastern side of the railway as the "eastern hospital grounds".

Based on the supplied Tender Document (Contract No. 0601164) and Addendum No. 1 (dated 4/5/06), we understand that the proposed redevelopment is still at concept stage. However, it is envisaged that the proposed redevelopment will comprise the demolition of some of the older existing buildings and the construction of new buildings and extensions (some with a single basement car parking level), multi-storey car parks, and a road bridge and separate footbridge spanning over the Main Southern Railway.

Since 1989, Jeffery and Katauskas Pty Ltd (J&K) have completed several geotechnical investigations at Liverpool Hospital. The details of these previous investigations are presented in Section 2. The Tender Documents nominated twelve boreholes to be drilled at Liverpool Hospital. From our previous work at the hospital, we had already drilled boreholes at or close to four nominated locations. As such, we provided a "Non-Conforming Tender" for eight boreholes in our proposal.

The purpose of the investigation was to assess the subsurface conditions at eight nominated borehole locations and, based on the information obtained, to present our preliminary comments and recommendations excavation conditions and retention, new footings, slab-on-grade, soil aggression and additional investigations. We have

also provided the relevant borehole logs from our previous investigations in Appendices A to G. At the request of DoC by email on 15 June 2006, we also provide earthquake design parameters for the proposed new buildings and structures.

In our proposal, we also allowed to submit a rock contour plan on condition that a survey plan was provided to us. We understand that a surveyor has not been commissioned for this stage of the project. As such, surface reduced levels (RL) could not be assigned to the current boreholes. A rock contour plan could be prepared once a detailed survey of the hospital grounds is completed.

The Tender Document also called for an assessment of hazardous substances. During the fieldwork, environmental samples were taken of both existing fill and natural soils so that they could be screened for volatile organic compounds and for common contaminant testing. This environmental assessment was carried out by Environmental Investigation Services (EIS), who are the environmental consulting division of J&K. Reference must be made to the EIS report, Ref: E20303F-RPT dated July 2006.

2 BACKGROUND INFORMATION

J&K have carried out several previous geotechnical investigations at Liverpool Hospital. A summary of our previous investigations is provided below. Most of the previous investigations were commissioned either directly by, or on behalf of, South Western Sydney Area Health Service.

1. Report Ref: 7088K dated 13 October 1989.

   This report was prepared for the Day Surgery building located at 33-35 Goulburn Street, Liverpool. The investigation comprised the auger drilling of four boreholes to either 4.5m or 4.6m depth. The borehole logs and borehole location plan are attached in Appendix A.

2. Report Ref: 7104J dated 2 November 1989.

   This report was prepared for the Health Service building located at the corner of Goulburn Street and Campbell Street, Liverpool. The investigation comprised the auger drilling of four boreholes to depths between 3.6m and 6.0m. The borehole logs and borehole location plan are attached in Appendix B.

3. Report Ref: 8471W dated November 1991.

   This report was prepared for several new buildings located over the western portion of the western hospital grounds, including the main Clinical building. The investigation comprised the drilling of eighteen boreholes to depths between 1.2m and 16.61m. The bedrock in seventeen of the eighteen boreholes was diamond core drilled. The borehole logs and borehole location plan are attached in Appendix C.

4. Report Ref: 9014W dated 11 August 1992.

   This report was prepared for the Brain Injury building, which is located in the western hospital grounds. The investigation comprised the auger drilling of four boreholes to depths between 5.45m and 5.75m. The borehole logs and borehole location plan are attached in Appendix D.

5. Report Ref: 9597WD dated 30 June 1993.

   This report was prepared for the Area Computing and Information Services Centre building and car park located at the south-eastern corner of the eastern hospital grounds. The investigation comprised the auger drilling of four deep boreholes, to depths between 19.63m and 22.75m, and two shallow boreholes to 1.5m depth. The borehole logs and borehole location plan are attached in Appendix E.

6. Report Refs: M17359WA dated 3 September 2003, M17359WA2 dated 10 December 2003, and M17359WA4 dated 16 July 2004.

   These three reports were prepared for the new Mental Health Centre building located in the western hospital grounds. The three investigations comprised the drilling of a total of ten boreholes to depths between 12.8m and 17.29m.

The bedrock in all boreholes was diamond core drilled. The borehole logs and borehole location plan are attached in Appendix F.

7. Report Ref: M17485WZA dated 24 April 2003.

   This report was prepared to assess the feasibility of a river boardwalk. The two relevant boreholes (BH1 & BH5) were auger drilled to 19.7m and 15.0m depth, respectively. The relevant borehole logs and borehole location plan are attached in Appendix G. We note that surface RLs were not provided to the borehole logs. BH5 was drilled at a lower elevation than BH1.

3 CURRENT INVESTIGATION PROCEDURE

On the 24 May 2006, the borehole locations were marked out by our Associate, Andrew Jackaman, using survey paint. The borehole locations were then set out by taped measurements from existing surface features and apparent property boundaries. The borehole locations are shown on the attached Figure 1. A specialist sub-consultant electro-magnetically scanned all borehole locations for buried services.

The fieldwork for the current investigation was carried out between 30 May 2006 and 14 June 2006 and comprised the drilling of nine boreholes (BH1001, BH1002, BH1003, BH1003A, BH1004 to BH1008) to depths typically between 6.05m (BH1007) and 23.72m (BH1005) depth below existing grade. BH1003 was terminated prematurely at 3.15m depth on an inferred buried pipe. All boreholes, except BH1008, were drilled using a truck mounted Edson 3000 drill rig. BH1008 was drilled using our specialist track mounted JK250 drill rig.

The pavements at BH1001 and BH1007 were diatube cored with water flush. The soil and upper bedrock profiles were solid flight auger drilled using a twin pronged tungsten carbide (TC) bit and/or, in the case of the deeper boreholes, rotary washbore drilled. The strength/relative density of the upper soil profile was assessed

from the Standard Penetration Test (SPT) 'N' values, together with hand penetrometer readings on clayey soils recovered in the SPT split-spoon sampler. The strength of the upper bedrock profile was assessed by observation of drilling penetration resistance, together with examination of recovered rock chips.

All boreholes, except BH1003, were then extended into the bedrock by rotary diamond coring techniques, using an NMLC triple tube core barrel with water flush. The strength of the cored bedrock was assessed by examination of the recovered rock core, together with correlations with subsequent laboratory Point Load Strength Index ($I_{s(50)}$) tests. Groundwater observations were made in the boreholes. On completion of the fieldwork, the boreholes were backfilled using the drill spoil and surface sealed with concrete plugs. Further details of the methods and procedures employed in the investigation are presented in the attached Report Explanation Notes.

Our geotechnical engineers were present full-time during the fieldwork to nominate testing and sampling, and to prepare the attached borehole logs. The Report Explanation Notes define the logging terms and symbols used.

Selected soil samples were returned to a NATA registered laboratory [Soil Test Services Pty Ltd (STS)] for moisture content testing. The results are summarised in the attached Table A. Selected soil samples were returned to another NATA registered laboratory (LabPoint Pty Ltd) for soil sulphate, chloride and pH testing. The results are summarised in the attached Appendix H.

The recovered rock cores from BH1001, BH1002, BH1003A, BH1004 to BH1008 were photographed and returned to STS for Point Load Strength Index testing. The photographs are enclosed facing the relevant cored borehole logs. The Point Load Strength Index test results are plotted on the cored borehole logs and are also summarised in the attached Table B. The unconfined compressive strengths (UCS),

as estimated from the Point Load Strength Index test results, are also summarised in Table B.

4 RESULTS OF THE CURRENT INVESTIGATION

4.1 Site Description

Both the western hospital grounds and the eastern hospital grounds have been described separately below. The hospital building names have been referenced from the supplied site plan, which forms the basis of Figure 1. As the proposed redevelopment project is at concept stage, the condition of each existing building has not been assessed.

4.1.1 Western Hospital Grounds

The western hospital grounds are located in relatively flat topography and are bound by Elizabeth Street to the south, the Main Southern Railway to the east and Goulburn Street to the west. Liverpool Girls' High School bounds the eastern three-quarters of the northern boundary, and Campbell Street, the remaining quarter length.

The south-eastern quadrant of the western hospital grounds was generally occupied by single storey buildings of brick and/or light weight clad construction. These low height buildings appeared to be supported on brick strip footings and/or brick piers. The remainder of the site was occupied by concrete framed, brick and/or precast concrete wall panel buildings which ranged in height between one and six levels, some of which containing basement levels. The details of the buildings are summarised below.

- Clinical: Two to six level building of concrete frame and brick wall construction, with a basement car park and loading dock level. On the eastern side of the building, at its southern end, the ground surface adjacent to the loading dock

driveway was supported by a brick faced retaining wall which was up to 4.5m high. On the northern side of the basement level, the courtyard between the Clinical and Caroline Chisholm buildings was supported by a slightly battered back concrete crib retaining wall, which was approximately 4m high. Both retaining walls appeared to be in good condition based on a cursory inspection. At the northern end of the Clinical building was a driveway, which descended from Goulburn Street to a second basement loading dock. No significant retaining walls were located in this area, as the adjacent Alex Grimson building, as described below, also contained a basement level. Based on our experience at the hospital, the footings of this building are founded in the underlying bedrock.

- Caroline Chisholm: Three level building of concrete frame and brick wall construction.
- Alex Grimson: Three level building of concrete frame and precast concrete wall construction, with a basement level. At the eastern end of the building, the basement level was buried. However, at the western end, a part of the basement office level was exposed as a result of a cut batter slope on its northern side and a basement level loading dock on its southern side.
- Cancer Therapy: One and two level building of concrete frame and brick wall construction.
- Pathology: Two to three level building of concrete frame and brick wall construction.
- Mental Health: Two level building of concrete frame and brick wall construction. Based on our previous experience at the site, this building is supported on piles founded in the underlying bedrock.
- Don Everett: Two level building of concrete frame and brick wall construction.
- Brain Injury: Single level brick building with a partial basement level at its eastern end.

- Car Park: Four level steel framed and concrete deck car park structure with some brick and concrete block walls. An open on-grade car park was located on its eastern side.
- Ron Dunbier: Three level building of concrete frame and brick wall construction.
- Old Library: Single level aluminium clad building supported on brick piers.

Surrounding the buildings/structures in the western hospital grounds were concrete and asphaltic concrete (AC) roadways and pavements, concrete footpaths, lawns, garden beds, shrubs and scattered trees. In particular, relatively dense vegetation was observed between the Alex Grimson, Pathology and Cancer Therapy buildings and at the north-eastern corner of the western hospital grounds (in the vicinity of BH1006).

On the northern side of Campbell Street were three hospital buildings including:

- Drugs & Alcohol: Two level brick building.
- Rainbow Cottage: Single level brick building.
- Health Services: Four level building of concrete frame and brick wall construction. We did not ascertain whether the superstructure was underlain by a basement level.

These buildings were surrounded by pavements, of either concrete or brick paver construction, and lawns which contained scattered trees.

4.1.2 Eastern Hospital Grounds

The eastern hospital grounds are also located in relatively flat topography and are bound by the Main Southern Railway to the west, the Georges River to the south and industrial buildings to the north and east. The eastern hospital grounds are not as built up as the western hospital grounds and comprised several on-grade AC and gravel surfaced car parking areas, an internal AC road network, lawn areas and scattered shrubs and trees.

The details of the buildings located in the eastern hospital grounds are summarised below.

- Staff Recreation: Single level brick building. An in-ground swimming pool and a tennis court were located to the north of this building.
- Child Care: Single level brick building.
- Staff Development: Single level brick building.
- Hugh Jardin: Single level brick building.
- Interpreter: Aluminium clad light-weight building supported on brick piers.
- Stores: Three aluminium clad light weight storage buildings.
- Area Physical Resources: Aluminium clad light-weight building supported on brick piers.
- Information Services: Two level building of concrete frame and brick wall construction.
- Area Administration: Two level building of concrete frame and brick wall construction.
- Modular Building: Aluminium clad light-weight building supported on brick piers.
- Central Energy: Steel frame and aluminium clad building, with steel cylinders up to approximately 14m high on its western side. On its eastern side were two external suspended steel structures, which supported large plant. To the west of this building, on the western side of the access road was a group of liquid oxygen cylinders up to approximately 7m high.

Along the southern side of the eastern hospital grounds, the riverbank graded steeply down to the Georges River for a vertical height of about 11m and was covered in dense vegetation. The subject length of the riverbank is located on a bend (erosion side) of the Georges River. The upper portion of the riverbank generally graded between 28° and 45°. The basal portion of the riverbank was generally scoured/eroded, resulting in steeper soil slopes (up to sub-vertical).

4.1.3 Services Tunnel

We understand that a services tunnel extends in a westerly direction from the Central Energy building in the eastern hospital grounds, below the Main Southern Railway, into the western hospital grounds. The approximate location of the services tunnel is shown on Figure 1. The details of the services tunnel (eg. width, invert level, etc.) and the location of the western end of the tunnel are unknown.

4.2 Subsurface Conditions

The 1:100,000 Series Geological Map of Penrith indicates the western end of the western hospital grounds to be underlain by residual soils then Bringelly Shale, and the remainder of the hospital grounds to be underlain by Tertiary alluvial soils, associated with the Georges River, then Bringelly Shale.

Generally, the boreholes drilled at the western end of the site (ie. BH1007 and BH1008) encountered pavements and fill overlying residual soils, then shale bedrock at relatively shallow depth. The remaining boreholes generally encountered pavements and fill overlying variable and deep alluvial soils, then shale bedrock. Reference should be made to the attached borehole logs for details at each specific location. A summary of the subsurface conditions encountered in the current boreholes is provided below.

Pavements

A 120mm thick reinforced concrete pavement was encountered in BH1001. In BH1007, 50mm thick brick pavers were encountered.

Fill

Fill, comprising clayey and/or granular soils, was encountered below the pavements in BH1001 and BH1007, and from the surface in the remaining boreholes, to depths between 0.2m (BH1004) and at least 3.15m (BH1003). Inclusions of igneous and

sandstone gravel, sandstone cobbles, concrete and brick fragments were encountered in the fill. The fill in BH1002, BH1003, BH1003A, BH1004, BH1006 and BH1008 was surfaced with grass. Based on the SPT results, the fill in BH1001, BH1003, BH1006 and BH1008 was assessed to be variably compacted, with poor compaction indicated in BH1001. BH1003 was terminated within the fill profile at 3.15m depth.

Alluvial Soils

Variable alluvial soils were encountered below the fill in BH1001, BH1002, BH1003A, BH1004, BH1005 and BH1006. The upper alluvial soil profile generally comprised silty clays and sandy clays of variable plasticity and of very stiff to hard strength. At depths between 2.0m (BH1005) and 7.0m (BH1003A), the alluvial clays were underlain by alluvial sands, silty sands and clayey sands, which in BH1001, BH1004, BH1005 and BH1006, extended down to the bedrock surface. The sands were generally medium dense to dense and contained clayey bands/zones which ranged in thickness between 0.5m and 3.0m. In BH1002 and BH1003A, the alluvial sands were underlain by alluvial silty clays and sandy clays of variable plasticity.

No SPTs were carried out within the basal alluvial soil profile as the boreholes were continuously rotary washbore drilled in order to prove bedrock. As such, an assessment of relative density and strength of the basal alluvial soil profile could not be made.

Residual Soils

Residual silty clays of predominantly high plasticity and of stiff to hard strength were encountered below the fill in BH1007 and BH1008.

Shale Bedrock

Shale bedrock was encountered in all boreholes, except BH1003, at depths between 2.2m (BH1007) and 21.55m (BH1005).

The shale bedrock in BH1001, BH1002, BH1003A, BH1004, BH1005 and BH1006 was generally fresh and of medium and high strength. In BH1001, BH1002 and BH1006, the upper shale profile was generally extremely to distinctly weathered and of extremely low and very low strength. This upper "weak" shale profile ranged in thickness between 0.25m (BH1006) and 0.7m (BH1001). The diamond cored portions of these six boreholes encountered few rock defects (including crushed seams, clay seams, extremely weathered seams, and joints). No rock defects were encountered in BH1005.

The shallower bedrock encountered in BH1007 and BH1008 was generally of poorer quality to the other boreholes and contained significant defects including deep weathered profile and core loss zones. In BH1007, distinctly weathered shale of medium strength was encountered at 4.9m depth and extended down to borehole termination at 6.05m depth. In BH1008, the bedrock profile was generally distinctly weathered and of low and medium strength.

An engineering classification of the shale bedrock (in accordance with Pells et al. 1978, as revised by Pells et al. 1998) has been carried out and is tabulated below. We note that the engineering classification is based on previous and current borehole information.

Borehole	Indicative Engineering Classification of Shale Bedrock Depths (m)				
	Class V	Class IV	Class III	Class II	Class I
BH1001	15.55-16.25	-	16.25-16.70	-	16.70-19.25
BH1002	15.90-16.20	-	16.20-17.50	-	17.50-19.28
BH1003A	-	17.00-17.30	- 19.00-20.00	17.30-19.00	-
BH1004	-	-	18.80-19.70	-	19.70-20.95
BH1005	-	-	-	-	21.55-23.72
BH1006	15.75-16.00	-	16.00-17.90	-	17.90-19.90
BH1007	2.20-4.90	-	4.90-6.05	-	-
BH1008	4.00-7.00	-	-	-	-

Groundwater

Groundwater seepage during augering was encountered in BH1001, BH1002, BH1003A, BH1004 and BH1005 at depths between 7.4m and 9.0m. BH1003, BH1006, BH1007 and BH1008 were "dry" on completion of augering. Due to the introduced drill flush water associated with the rotary washbore drilling and the rock coring, no meaningful final groundwater observations were made. However, full water return was encountered during rock coring in all boreholes, indicating a relatively impermeable rock mass. We note that the groundwater levels may not have stabilised within the limited observation period. No long-term groundwater monitoring was carried out.

4.3 Laboratory Test Results

The soil pH tests carried out on samples of the natural soils from all boreholes, except BH1003, resulted in values between 5.1 and 7.0, indicating moderately acidic to neutral soil conditions. The soil sulphate tests carried out on the same samples resulted in values between 21mg/kg and 132mg/kg. The soil chloride tests also carried out on the same samples resulted in values between <100mg/kg and 156mg/kg.

The laboratory test results from two of our previous investigations at the hospital indicated soil pH values as low as 4.1 and 4.6 for natural soil samples. These low soil pH values indicate moderately to highly acidic soil conditions.

The result of the moisture content test carried out on a recovered rock chip sample from BH1007 correlated well with our field assessment of the upper bedrock strength. The results of the Point Load Strength Index tests carried out on the recovered rock cores correlated well with our field assessment of bedrock strength. The estimated UCSs generally ranged from 2MPa to 36MPa, however, values as high as 46MPa and 48MPa were indicated in BH1004 and BH1005.

5 COMMENTS AND RECOMMENDATIONS

5.1 Geotechnical Issues

We consider the following to be the primary geotechnical issues for the proposed Liverpool Hospital Redevelopment Project:

- Presence of fill and its suitability to support structural loads.
- Presence of a clayey subsoil with an expected high potential for shrink-swell movements with changes in moisture content.
- Presence of a service tunnel and significant undocumented buried services.
- Excavation adjacent to buildings which do not contain basement levels.
- Ground borne vibration emissions associated with demolition and the trafficking of construction plant.
- Pile construction based on the varying depth to bedrock and relatively shallow groundwater table.

The effects of the above geotechnical issues on design and construction are detailed below. However, as the proposed redevelopment is at concept stage, specific recommendations cannot be provided. As such, the following comments and

recommendations are generalised and will need to be reassessed once the redevelopment details have been finalised.

5.2 Existing Buried Services

We strongly recommend that a detailed services search be carried out for all external areas of the hospital, particularly below the proposed redevelopment areas. The locations of many existing buried services is unknown to the hospital maintenance staff, as we encountered during the set out of previous and current boreholes. The details should then be plotted onto a survey plan for future reference.

Buried services can then be rerouted if required. Alternatively, piles can be located appropriately to bridge across existing buried services. Similarly, buried service information would be helpful during proof rolling inspection, particularly if trench backfill heaves under the roller.

5.3 Site Earthworks

All earthworks recommendations provided for the proposed Liverpool Hospital Redevelopment Project should be complemented by reference to AS3798-1996 ("Guidelines on Earthworks for Commercial and Residential Developments").

5.3.1 Existing Fill

No details on the existing fill (ie. placement method, compaction specification, density test records, etc.) have been provided to us. The fill was assessed to be variably compacted, and in the case of BH1001, poor compaction was indicated. As such, we consider the existing fill to be "uncontrolled". In its current condition, the fill is not suitable to support high level footings, but will most likely be suitable to support the proposed external pavements on condition that the subgrade preparation works, as outlined below in Section 5.3.7, are carried out.

5.3.2 Demolition

Care must be taken during demolition so that ground borne vibrations to nearby buildings and movement sensitive buried services are controlled. Depending on the details and extent of demolition, it may be necessary to install vibration monitors on nearby buildings to assess vibration levels.

5.3.3 Removal of Existing Trees

The proposed redevelopment areas contain scattered trees. We note that the existing trees have likely caused localised "drying out" of the surrounding clayey soils. Removal of the trees will therefore lead to the recovery of the clay soil moisture content, resulting in differential swell movements in the vicinity of the trees. The swell movements generated by the removal of the trees are in addition to the shrink-swell movements, which can occur in the clayey soils due to weather related natural moisture changes and by the reduction in surface evaporation subsequent to covering the site with buildings and pavements. The latter shrink/swell movements are outlined in AS2870-1996 ("Residential Slabs and Footings – Construction").

It is likely that moisture equilibrium in the clayey soils, following removal of the tree stumps and roots, could take one to two years to develop, possibly longer if the current "drought" persists. In order to reduce the effects that removal of the trees will have on proposed on-grade buildings/structures and pavement areas, we recommend they be removed as early as possible ahead of construction.

5.3.4 Site Drainage

The clay subgrade at the site is expected to undergo substantial loss in strength when wet. Furthermore, the clayey subgrade is also expected to have a high shrink-

swell reactive potential. Therefore, it is important to provide good and effective site drainage both during construction and for long-term site maintenance. The principle aim of the drainage is to promote run-off and reduce ponding. A poorly drained clay subgrade may become untraffickable when wet. The earthworks should be carefully planned and scheduled to maintain good cross-falls during construction.

5.3.5 Excavation

Prior to any excavation commencing we recommend that reference be made to the WorkCover Authority of NSW's "Code of Practice – Excavation Work" dated 31 March 2000 (Cat. No. 312).

Furthermore, test pits will be required to confirm the footing details and foundation materials of all adjoining buildings/structures. Underpinning may be required for adjacent on-grade buildings supported on high level footings. The need for underpinning will need to be jointly assessed by an experienced geotechnical engineer and the structural engineer during the test pitting works.

In areas of proposed new single basements, we expect that the soil profile can be readily excavated using hydraulic excavators or backhoes. Rock excavation may be required at the western end of the site. Based on the weathered nature of the bedrock, as encountered in BH1007 and BH1008, we recommend that excavation of the shale bedrock be carried out using the bucket and ripping tyne of a large excavator. We are not in favour of using hydraulic rock hammers due to noise nuisance and the potential for ground borne vibration damage to nearby buildings/structures.

5.3.6 Seepage

Groundwater inflows into the single basement excavations may occur as local seepage flows at the base of any fill, through gravel bands or relic joints within the

alluvial and residual silty clays, at the clay/bedrock interface, and through joints and bedding partings within the bedrock profile, particularly after heavy rain. Seepage volumes into the excavation are expected to be controllable by conventional sump and pump dewatering systems.

5.3.7 Subgrade Preparation

The following subgrade preparation recommendations are applicable for new buildings not underlain by a basement level and for external pavements. Following demolition and removal of all trees and other vegetation, all grass, topsoil, root-affected soil and any deleterious or contaminated existing fill should be stripped. Stripped topsoil and root affected soils should be stockpiled separately as they are not suitable for reuse as engineered fill. They may however be reused for landscaping purposes. Reference should be made to the EIS report for guidance on the offsite disposal of soil. Care should be taken during site stripping not to undermine or remove support from adjacent buildings, structures or pavements.

Following stripping, the exposed soil subgrade below proposed building and pavement footprints should be proof rolled with at least eight passes of a large static smooth drum roller (say, at least 15 tonnes deadweight). The vibratory mode on the roller should not be used due to the close proximity of nearby existing buildings and structures and buried services, and the need to limit ground borne vibrations. The final pass of proof rolling should be carried out under the direction of an experienced geotechnical engineer for the detection of unstable or soft areas.

Subgrade heaving during proof-rolling may occur in areas where clayey subgrade may have become "saturated". Heaving areas should be locally removed to a stable base and replaced with engineered fill, as outlined below in Section 5.3.8, or further advice could be sought. If soil softening occurs after prolonged periods of rainfall, then the subgrade should be over-excavated to below the depth of moisture

softening and replaced with engineered fill. If the clayey subgrade exhibits shrinkage cracking, then the surface should be watered and rolled until the shrinkage cracks are no longer evident.

Engineered fill must be used to raise site levels up to design subgrade level.

5.3.8 Engineered Fill

Materials preferred for use as engineered fill are well graded granular materials such as ripped or crushed sandstone, which are "clean", free of organic matter and particle sizes greater than 75mm. The benefit of granular materials is that their compaction specification and controls, as outlined below, are less stringent than for clayey soils. Stripped or excavated clayey and granular soils may be reused as engineered fill on condition that they too are "clean", free of organic matter and particle sizes greater than 75mm. Stripped or excavated granular soils should be mixed in with the clayey soils.

Engineered fill comprising well graded granular materials, such as imported ripped or crushed sandstone, should be compacted in maximum 200mm thick loose layers using a large static roller to a minimum density of 98% of Standard Maximum Dry Density (SMDD). Engineered fill comprising stripped or excavated soils should also be compacted in maximum 200mm thick loose layers using a large static roller to a density strictly between 98% and 102% of SMDD and at a moisture content within 2% of Standard Optimum Moisture Content (SOMC).

Density tests should be regularly carried out on the engineered fill to confirm the above specifications are achieved. The frequency of density testing and level of earthworks inspection and testing will need to be assessed by ourselves once the redevelopment details have been finalised. Nonetheless, the geotechnical testing

authority should be directly engaged by the client and not by the earthworks contractor.

5.4 Retention Systems

Recommendations on retention systems will be provided once the redevelopment details have been finalised. Nonetheless, for single basement levels, the sides could be temporarily battered back at no steeper than 1 Vertical (V) on 1 Horizontal (H), space permitting, and on condition that surcharge loads are kept well away from the perimeter of the excavation. Conventional reinforced block retaining walls can then be constructed along the toe of the batter slopes, and later backfilled.

If batter slopes cannot be accommodated within the available site geometry, or are not preferred, then cast insitu retention systems, such as a contiguous pile walls, will need to be considered.

5.5 New Footings

5.5.1 Light-Weight Buildings

For light weight on-grade buildings, high level footings founded in either alluvial or residual silty clay of at least very stiff strength can be adopted. Such footings can be designed for a maximum allowable bearing pressure of 150kPa. If the proposed building footprint is underlain by deep fill, then it will most likely be necessary to support the building on piles founded within the deep alluvial soil profile or in bedrock, if shallow (ie. in the vicinity of BH1007 and BH1008).

5.5.2 Larger Buildings and Bridges

Based on the previous and current borehole logs, we recommend that proposed new larger buildings/extensions and bridges be uniformly supported on piles founded in the shale bedrock.

We have considered supporting these proposed structures on high level pad and strip footings founded in the very stiff and hard alluvial or residual clays, however, this option was not favoured based on the issues outlined below:

- The maximum allowable bearing pressure would be limited to about 150kPa, thus requiring large pad footings for high column loads.
- Variable alluvial soil profile of varying strengths/relative densities would likely induce differential settlements between footings. Based on this, additional boreholes or Electric Friction Cone Penetration (EFCP) tests, would be required to further assess the variability in the alluvial soil profile. We note that "soft" alluvial clays were encountered below 7m depth at the north-western corner of the Mental Health building (refer to BH101 in Appendix F). Specific settlement analyses taking in account specific footing sizes, loads and locations, would also be required to assess the feasibility of this option.

Due to the presence of sandy soils and groundwater, we recommend that the proposed new buildings/structures be supported on continuous flight auger (CFA) piles. CFA piles socketed at least 0.3m into the underlying Class V or better quality shale may be designed for a maximum allowable end bearing pressure of 700kPa. Deeper sockets may be designed using an allowable shaft adhesion value (in compression) of 70kPa. Alternatively, CFA piles socketed at least 0.3m into Class III or better quality shale may be designed for a maximum allowable bearing pressure of 3500kPa. Deeper sockets into the Class III or better quality shale may be designed using an allowable shaft adhesion value (in compression) of 350kPa.

Higher end bearing pressures would most likely be justified on the Class II or Class I shale, however, further rock proving by completion of a number of additional cored boreholes would be required for confirmation.

The bearing pressures above are based upon a serviceability criteria of deflections at the pile toe of less than 1% of the pile diameter.

Piles on the shale bedrock may also be designed using "Limit State Design" principles as detailed in the paper "Foundations on Sandstone and Shale in the Sydney Region" by Pells, Mostyn and Walker (Australian Geomechanics, Number 33, Part 3, December 1998, pages 17-29). For limit state design, ultimate bearing capacities up to 30MPa could tentatively be adopted for Class III shale bedrock at the site (based on the limited borehole data), provided that settlements to 5% of the pile diameter can be tolerated and an extensive pile test program is undertaken. It should be noted that such ultimate bearing pressures must be used in conjunction with an appropriate geotechnical strength reduction factor (ϕ_g) which is dependent upon:

- Both the amount and quality of information available for the founding layer;
- The quality of workmanship and control in the piling process, and;
- The quality of a pile test program.

The strength reduction factor should be selected following reference to Tables 4.1 and 4.2 of AS2159-1995 ("Piling – Design and Installation"). It must be understood that the use of limit state design to adopt relatively high bearing pressures (above the serviceability criteria described above) is not currently standard practice, and there is increased risk of inadequate performance of the piles.

The major limitation when using CFA piles is the maximum available diameter of the pile; usually 0.9m. For high column loads, pile groups may be required to support

individual column loads. It is important to keep in mind that there are penetration limitations when using CFA piling rigs and it may not be possible to socket the piles into Class II and Class I shale, and where there is medium and high strength shale in the Class III profile. We recommend that only very large CFA piling rigs be brought to site and that the prospective piling contractor be provided with a full copy of this report and any additional geotechnical reports.

At the boreholes where an adequately thick alluvial sand profile was encountered (ie. BH1001, BH1002, BH1003A, BH1004, BH1005 and BH1006), it may be possible to support the structural loads on CFA piles or steel (helix) screw piles founded within the sand profile. Bearing pressures in the order of least 1000kPa are anticipated for such piles founded within medium dense or denser sands. To assess the feasibility of this option and the suitability of steel screw piles, EFCP testing will be required to confirm the depth, thickness and lateral continuity of the sands. Based on our previous work, the thickness of the alluvial sand layer reduces significantly in a westerly direction to the west of the Main Southern Railway.

5.6 Slab-on-Grade

Slab-on-grade construction for proposed new buildings is considered feasible provided the subgrade is prepared as discussed in Section 5.3.7. Slabs-on-grade should be constructed independent of the building footings and walls (ie. designed as "floating" slabs) to permit relative movement.

Building slabs-on-grade should be supported on at least a 100mm thick sub-base of an appropriate granular sub-base layer, and compacted to a minimum density of 100% of SMDD. The sub-base material will provide more uniform slab support and would provide a more stable working platform during construction.

5.7 Soil Aggression

The current and previous laboratory soil pH tests have generally indicated moderately to highly acidic subsoil conditions. Reference should therefore be made to the Cement & Concrete Association of Australia Technical Note TN57 and to Section 6 of AS2159-1995 for appropriate precautionary measures.

5.8 Earthquake Design Parameters

For earthquake design in accordance with AS1170.4-1993 ("Minimum Design Loads on Structures, Part 4: Earthquake Loads"), the following design parameters should be adopted:

- Site Factor (S) = 1.0
- Acceleration Coefficient (α) = 0.08

5.9 Additional Geotechnical Investigations

Once the redevelopment details are finalised, we recommend that we be provided with a copy of the drawings for review so that an assessment can be made on whether additional investigations and more specific advice are required.

6 GENERAL COMMENTS

The recommendations presented in this report include specific issues to be addressed during the construction phase of the project. As an example, special treatment of soft spots may be required as a result of their discovery during proof-rolling, etc. In the event that any of the construction phase recommendations presented in this report are not implemented, the general recommendations may become inapplicable and Jeffery and Katauskas Pty Ltd accept no responsibility whatsoever for the performance of the structure where recommendations are not implemented in full and properly tested, inspected and documented.

The long-term successful performance of floor slabs is dependent on the satisfactory completion of the earthworks. In order to achieve this, the quality assurance program should not be limited to routine compaction density testing only. Other critical factors associated with the earthworks may include subgrade preparation, selection of fill materials, control of moisture content and drainage, etc. The satisfactory control and assessment of these items may require judgement from an experienced engineer. Such judgement often cannot be made by a technician who may not have formal engineering qualifications and experience. In order to identify potential problems, we recommend that a pre-construction meeting be held so that all parties involved understand the earthworks requirements and potential difficulties. This meeting should clearly define the lines of communication and responsibility.

Occasionally, the subsurface conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact this office.

This report provides advice on geotechnical aspects for the proposed civil and structural design. As part of the documentation stage of this project, Contract Documents and Specifications may be prepared based on our report. However, there may be design features we are not aware of or have not commented on for a variety of reasons. The designers should satisfy themselves that all the necessary advice has been obtained. If required, we could be commissioned to review the geotechnical aspects of contract documents to confirm the intent of our recommendations has been correctly implemented.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development

described in this report then all recommendations should be reviewed. Copyright in this report is the property of Jeffery and Katauskas Pty Ltd. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

Should you have any queries regarding this report, please do not hesitate to contact the undersigned.

Andrew Jackaman
Associate
South-Western Sydney Office Manager

Reviewed By:

for **Agi Zenon**
Senior Associate
For and on behalf of
JEFFERY AND KATAUSKAS PTY LTD

Unit 3, 39 Buffalo Road
Gladesville, NSW 2111
Telephone: 02 9809 7322
Facsimile: 02 9809 7626
Email: dtreweek@jkgroup.net.au

SOIL TEST SERVICES
ABN 43 002 145 173

Ref No: M20303ZA
Table A: Page 1 of 1

TABLE A
SUMMARY OF MOISTURE CONTENT TEST RESULTS

AS 1289 **TEST METHOD** **2.1.1**

BOREHOLE NUMBER	DEPTH	MOISTURE CONTENT
	m	%
1001	1.30-1.75	23.6
1001	2.85-3.30	19.7
1001	4.35-4.80	16.7
1001	5.90-6.35	18.6
1007	2.50-2.90	5.2

Unit 3, 39 Buffalo Road
Gladesville, NSW 2111
Telephone: 02 9809 7322
Facsimile: 02 9809 7626
Email: dtreweek@jkgroup.net.au

SOIL TEST SERVICES
ABN 43 002 145 173

TABLE B
SUMMARY OF POINT LOAD STRENGTH INDEX TEST RESULTS

BOREHOLE NUMBER	DEPTH m	$I_{S(50)}$ MPa	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)
1001	16.71-16.74	0.7	14
	17.12-17.15	1.2	24
	17.81-17.83	1.1	22
	18.15-18.18	1.4	28
	18.91-18.93	0.9	18
	19.23-19.25	1.1	22
1002	16.35-16.37	0.8	16
	16.89-16.91	1.4	28
	17.13-17.15	0.6	12
	17.91-17.94	1.5	30
	18.21-18.23	0.8	16
	18.78-18.82	1.3	26
	19.25-19.28	1.7	34
1003A	17.14-17.16	0.7	14
	17.92-17.94	0.4	8
	18.10-18.13	0.9	18
	18.85-18.87	0.9	18
	19.10-19.13	0.8	16
	19.92-19.95	1.5	30
1004	18.88-18.90	1.1	22
	19.04-19.06	1.3	26
	19.89-19.92	0.9	18
	20.15-20.17	2.3	46
1005	21.70-21.73	2.4	48
	22.22-22.25	1.8	36
	22.90-22.92	1.0	20
	23.46-23.48	0.7	14

Notes: See page 2 of 2

Unit 3, 39 Buffalo Road
Gladesville, NSW 2111
Telephone: 02 9809 7322
Facsimile: 02 9809 7626
Email: dtreweek@jkgroup.net.au

SOIL TEST SERVICES
ABN 43 002 145 173

TABLE B
SUMMARY OF POINT LOAD STRENGTH INDEX TEST RESULTS

BOREHOLE NUMBER	DEPTH	$I_{S(50)}$	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH
	m	MPa	(MPa)
1006	16.90-16.92	1.2	24
	17.05-17.09	0.9	18
	17.92-17.95	1.3	26
	18.11-18.13	1.3	26
	18.87-18.89	1.2	24
	19.69-19.72	1.5	30
1007	3.42-3.44	0.6	12
	5.00-5.02	0.9	18
	5.43-5.45	0.8	16
	5.98-6.00	0.7	14
1008	4.80-4.82	0.2	4
	5.07-5.10	0.5	10
	5.36-5.38	0.9	18
	6.15-6.18	0.4	8
	6.60-6.63	0.3	6
	6.87-6.89	0.1	2

NOTES:

1. In the above table testing was completed in the Axial direction.
2. The above strength tests were completed at the 'as received' moisture content.
3. Test Method: RTA T223.
4. The Estimated Unconfined Compressive Strength was calculated from the point load Strength Index by the following approximate relationship and rounded off to the nearest whole number :
   U.C.S. = 20 $I_{S(50)}$

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1001 1/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 30-5-06 **Datum:**

Logged/Checked by: M.T./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			CONCRETE: 120mm.t				7mm DIAMETER REINFORCEMENT, 45mm AND 55mm TOP COVER
					N = 8 7,3,5			-	FILL: Silty sand, fine to medium grained, dark grey, with concrete and brick fragments and igneous gravel.	M	-	-	APPEARS POORLY COMPACTED
						1		CH	SILTY CLAY: high plasticity, brown, red and light grey, with root fibres and a trace of ironstone gravel.	MC > PL	VSt	-	ALLUVIAL
					N = 8 3,4,4							310 320 310	
						2							
					N = 19 5,8,11	3			as above, but with no root fibres.	MC < PL	H	410 410 500	
						4							
					N = 17 5,8,9							410 450 460	
						5							
					N = 18 6,7,11	6				MC > PL	VSt	280 260 320	
						7		SC	CLAYEY SAND: fine to medium grained, light grey mottled orange brown.	M	(D)		

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1001 2/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 30-5-06 **Datum:**

Logged/Checked by: M.T./KH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SP	SAND: fine to medium grained, orange brown and light grey.	M	(D)		
					N > 15 8,15/ 130mm REFUSAL				as above, but light grey.				
						8			SAND: fine to coarse grained, brown.	W			
					N > 3 15,3/ 10mm REFUSAL	9							CONTINUOUS SPIRAL AUGER AND WASHBORE DRILLING (ie NO INSITU TESTING) FROM 9.16m DOWN TO 15.55m IN ORDER TO PROVE BEDROCK
						10		SC	CLAYEY SAND: fine to medium grained, brown.				
						11							
						12		SM	SILTY SAND: fine to medium grained, light grey, with occasional clay bands.				COMMENCE ROTARY WASHBORE DRILLING
						13			as above, but brown and dark grey.				
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1001** 3/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

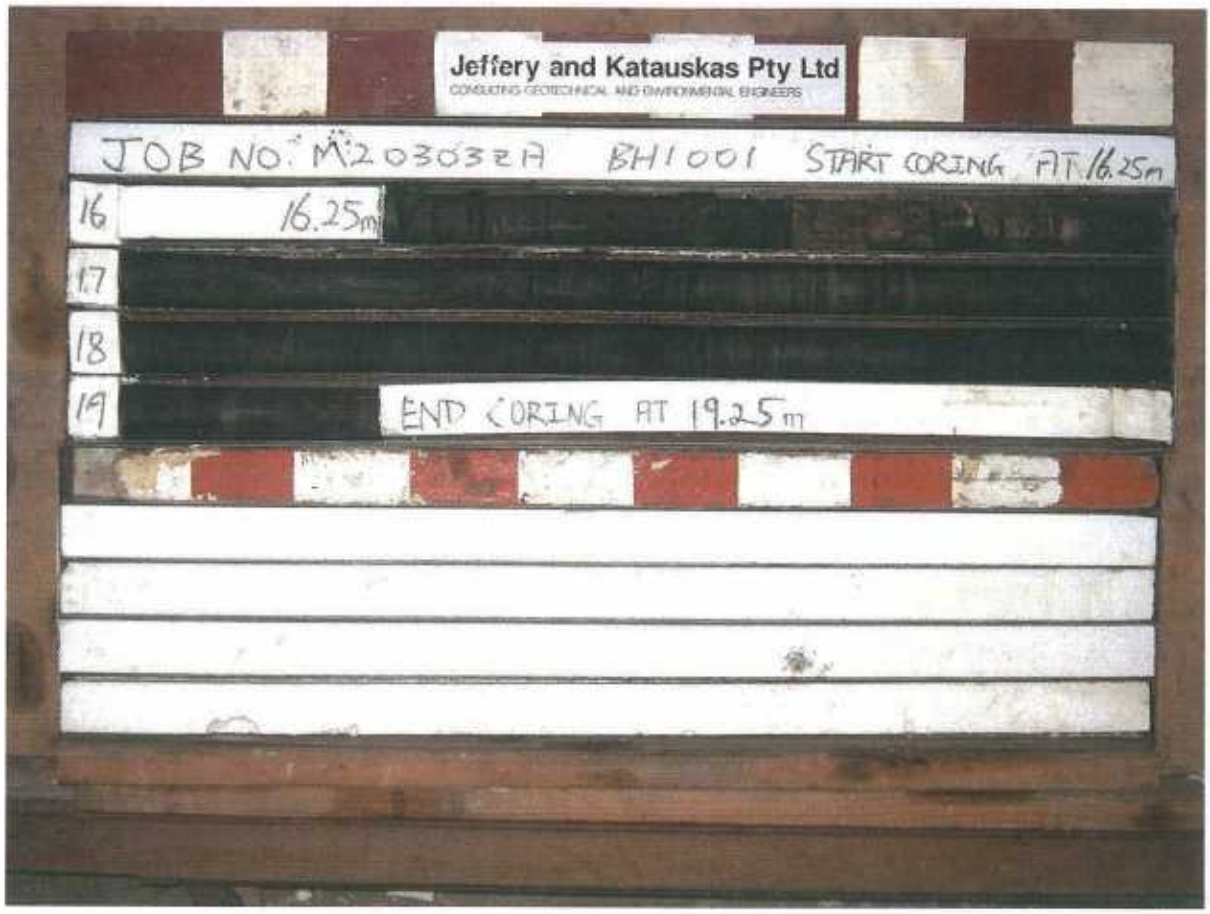
Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 30-5-06 **Datum:**

Logged/Checked by: M.T./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						15		SM	SILTY SAND: fine to medium grained, brown and dark grey, with occasional clay bands.	W	-		
						16		-	SHALE: dark grey, with clay seams.	XW-DW	EL-VL	-	
						17			REFER TO CORED BOREHOLE LOG				
						18							
						19							
						20							


Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
JOB NO. M20303ZA BH1001 START CORING AT 16.25m
16
16.25m
17
18
19
END CORING AT 19.25m

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1001** 4/4

CORED BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE
Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT
Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Core Size:** NMLC **R.L. Surface:**
Date: 31-5-06 **Inclination:** VERTICAL **Datum:**
Drill Type: EDSON 3000 **Bearing:** - **Logged/Checked by:** M.T./AJH

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		15							
		16		START CORING AT 16.25m					
FULL RET-URN		17		SHALE: dark grey, with fine grained, light grey sandstone laminae. bedded at 0-5°, spacing up to 5mm.	Fr	M-H L-M M M-H	× × × × ×		CS, 20mm.t - CS, 10mm.t - Cr, 5mm.t
		18							
		19							
				END OF BOREHOLE AT 19.25m					
		20							
		21							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1002** 1/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 9-6-06 **Datum:**

Logged/Checked by: M.T./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty clay, medium plasticity, dark grey and dark brown, with concrete fragments and igneous gravel and a trace of fine to medium grained sand and root fibres.	MC < PL			GRASS COVER
					N = 23 9,11,12			CL		MC < PL	H	-	ALLUVIAL
						1		CH	SILTY CLAY: low to medium plasticity, light brown, with a trace of root fibres.			> 600 > 600 > 600	
					N = 29 9,13,16				as above, but high plasticity, brown, red brown and light grey.			> 600 > 600 > 600	
						2		CH	SANDY CLAY: high plasticity, light grey, light brown and red brown.				
					N > 27 16,22, 5/20mm END	3		SP	SAND: fine to medium grained, light grey, yellow brown and red brown, with a trace of clay fines.	M	D		
						4			as above, but light brown and light grey.				
					N > 29 14,23, 6/15mm END	5		SC	CLAYEY SAND: fine to coarse grained, light grey, red and yellow brown, with occasional clay seams.				
									as above, but fine to medium grained, light grey.				
					N = 33 14,15,18	6		SP	SAND: fine to medium grained, light grey and light brown.				
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1002 2/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 9-6-06 **Datum:**

Logged/Checked by: M.T./AJH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						8		SP	SAND: fine to coarse grained, grey and brown, with a trace of clay fines.	M	D		
▶										W	MD		
					N = 10 4,6,4	9			as above, but grey.				
						10							
						11							
								CL-CH	SANDY CLAY: medium to high plasticity, light grey and red brown.	MC>PL	(St-VSt)		
					N = 7 4,3,4	12							
						13							COMMENCE ROTARY WASHBORE DRILLING
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1002 3/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 9-6-06 **Datum:**

Logged/Checked by: M.T./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						15		CL-CH	SANDY CLAY: medium to high plasticity, light grey and red brown.	MC>PL	-		CONTINUOUS WASHBORE DRILLING (ie NO INSITU TESTING) FROM 12.45m DOWN TO 15.9m IN ORDER TO PROVE BEDROCK
						16		-	SHALE: dark grey, with clay seams.	XW	EL	-	
									REFER TO CORED BOREHOLE LOG				
						17							
						18							
						19							
						20							


Jeffery and Katauskas Pty Ltd
JOB NO. M20303ZA BH1002 START CORING AT 16.20m
16
17
18
19
END CORING 19.28m

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1002** 4/4

CORED BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE
Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT
Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Core Size:** NMLC **R.L. Surface:**
Date: 9-6-06 **Inclination:** VERTICAL **Datum:**
Drill Type: EDSON 3000 **Bearing:** - **Logged/Checked by:** M.T./KJJ

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		15							
		16		START CORING AT 16.20m					
FULL RETURN		17		SHALE: dark grey, with fine grained, light grey sandstone laminae, bedded at 0°-5°, spacing up to 3mm.	Fr	M-H	×		- Be, 20°, P, S - Be, 20°, P, S - Be, 20°, P, S
		18					×		
		19				H	×		]- J, 75°, Un, R
				END OF BOREHOLE AT 19.28m					
		20							
		21							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1003 1/1

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER **R.L. Surface:**
EDSON 3000

Date: 13-6-06 **Datum:**

Logged/Checked by: M.T./[illegible]

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty clay, medium plasticity, dark grey, with a trace of fine to medium grained sand, igneous gravel, root fibres and concrete fragments.	MC < PL			GRASS COVER APPEARS MODERATELY COMPACTED
					N = 10 3,4,6	1							
					N = 10 3,4,6				FILL: Silty clay, high plasticity, light grey, red brown and brown, with a trace of fine to coarse grained sand, igneous gravel, concrete fragments and sandstone gravel.				
						2							
						3			END OF BOREHOLE AT 3.15m				'TC' BIT REFUSAL ON INFERRED BURIED PIPE
						4							
						5							
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1003A 1/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 13-6-06 **Datum:**

Logged/Checked by: M.T./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty clay, medium plasticity, dark grey, with a trace of concrete fragments, igneous and sandstone gravel and root fibres.	MC<PL			GRASS COVER
						1			FILL: Sand, fine to medium grained, dark brown, with sandstone gravel and cobbles (up to 120mm.t).	M			
						2							
								CH	SILTY CLAY: high plasticity, light grey and red brown, with ironstone gravel.	MC<PL	H	-	ALLUVIAL
					N > 28 7,13, 15/70mm END	3						>600 >600 >600	
						4							
					N = 27 7,12,15							540 560 >600	
						5							
								CH	SANDY CLAY: high plasticity, light grey and orange brown, with a trace of ironstone gravel.				
					N > 25 9,17, 8/40mm END	6						>600 >600 >600	
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1003A** 2/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING EDSON 3000 **R.L. Surface:**

Date: 13-6-06 **Datum:**

Logged/Checked by: M.T./AJH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SC	CLAYEY SAND: fine to medium grained, light grey and orange brown, with clay seams.	M	MD		
						8		SP	SAND: fine to coarse grained, brown, with clay fines.				
▶					N = 20 9,10,10	9		SC	CLAYEY SAND: fine to coarse grained, light grey and brown.	W			CONTINUOUS SPIRAL AUGER AND WASHBORE DRILLING (ie NO INSITU TESTING) FROM 9.45m DOWN TO 17.00m DEPTH IN ORDER TO PROVE BEDROCK
						10							
						11							
						12							COMMENCE ROTARY WASHBORE DRILLING
						13		SM	SILTY SAND: fine to coarse grained, grey.				
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1003A 3/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

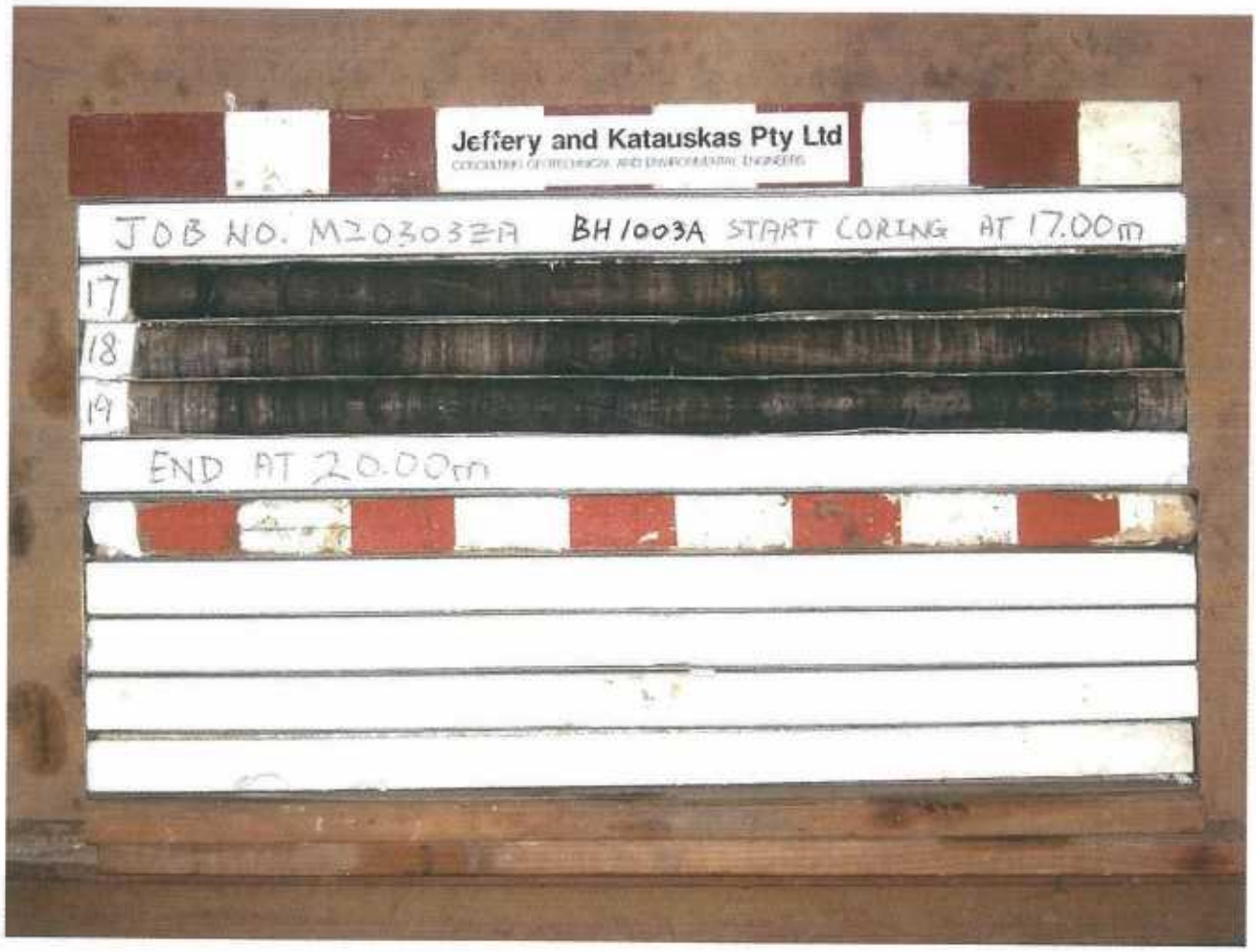
Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 13-6-06 **Datum:**

Logged/Checked by: M.T./AJ

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						15		CL-CH	SANDY CLAY: medium to high plasticity, dark grey and brown.	MC>PL	-		
						16		SP	SAND: fine to coarse grained, dark brown.	W			
								CH	SILTY CLAY: high plasticity, grey and brown.	MC>PL			
						17			REFER TO CORED BOREHOLE LOG				
						18							
						19							
						20							


Jeffery and Katauskas Pty Ltd
JOB NO. M20303ZA BH1003A START CORING AT 17.00m
17
18
19
END AT 20.00m

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1003A** 4/4

CORED BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Core Size:** NMLC **R.L. Surface:**

Date: 14-6-06 **Inclination:** VERTICAL **Datum:**

Drill Type: EDSON 3000 **Bearing:** - **Logged/Checked by:** M.T./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		16							
				START CORING AT 17.00m					
FULL RET-URN		17		SHALE: dark grey, with fine grained, light grey sandstone laminae bedded 0-5°, spacing up to 5mm.	Fr	M	×		- Cr, 20mm.t - XWS/Cr, 5mm.t
		18					× ×		
							×		
		19					×		- J, 70°, P, S - XWS/Cr, 70mm.t - J, 60°, P, R - J, 35°, P, S - J, 80°, P, S
		20				H	×		- Be, 20°, P, S
				END OF BOREHOLE AT 20.00m					
		21							
		22							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1004 1/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 1-6-06 **Datum:**

Logged/Checked by: M.T./AGH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty sand, fine to medium grained, dark brown, with igneous gravel and root fibres.	M			GRASS COVER
								SP		D	(L)	-	ALLUVIAL
								CH	SAND: fine to coarse grained, light brown, with a trace of ironstone gravel.	MC < PL	H	>600	
					N = 38 13,17,21							>600 >600	
						1			SILTY CLAY: high plasticity, red brown and light grey, with a trace of fine to medium grained sand and ironstone gravel.				
					N = 37 11,16,21			CH	SANDY CLAY: high plasticity, red brown and light grey, with a trace of ironstone gravel.			>600 >600 >600	
						2							
					N = 36 11,15,21	3		SC	CLAYEY SAND: fine to medium grained, red brown and light grey, with ironstone gravel.	M	D		
								SP	SAND: fine to medium grained, light grey and orange brown, with occasional silty clay seams.				
						4							
					N > 29 18,25, 4/10mm END				as above, but orange brown, red and light grey.				
						5		SC	CLAYEY SAND: fine to medium grained, red brown and light grey.				
					N > 17 12,17/ 150mm END	6		SC/CL	CLAYEY SAND/SANDY CLAY: fine to medium grained, high plasticity, light grey.	M/ MC < PL	D/ H		
								SP	SAND: fine to medium grained, light grey and brown.	M	D		
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1004** 2/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 1-6-06 **Datum:**

Logged/Checked by: M.T./AJH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
					N > 11 17,11/ 50mm END	8		SP	SAND: fine to coarse grained, light grey and brown.	M	D		
▶						9		SP	SAND: fine to coarse grained, dark grey, with clay seams.	W			
									SAND: fine to coarse grained, yellow brown, with clay fines.		MD		
					N = 11 7,4,7	10			as above, but with clay bands.				
						11							
					N = 27 5,13,14	12							
						13		SC/CH	CLAYEY SAND/SANDY CLAY: fine to medium grained, high plasticity, brown and light grey.	W/ MC>PL	-		COMMENCE ROTARY WASHBORE DRILLING
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

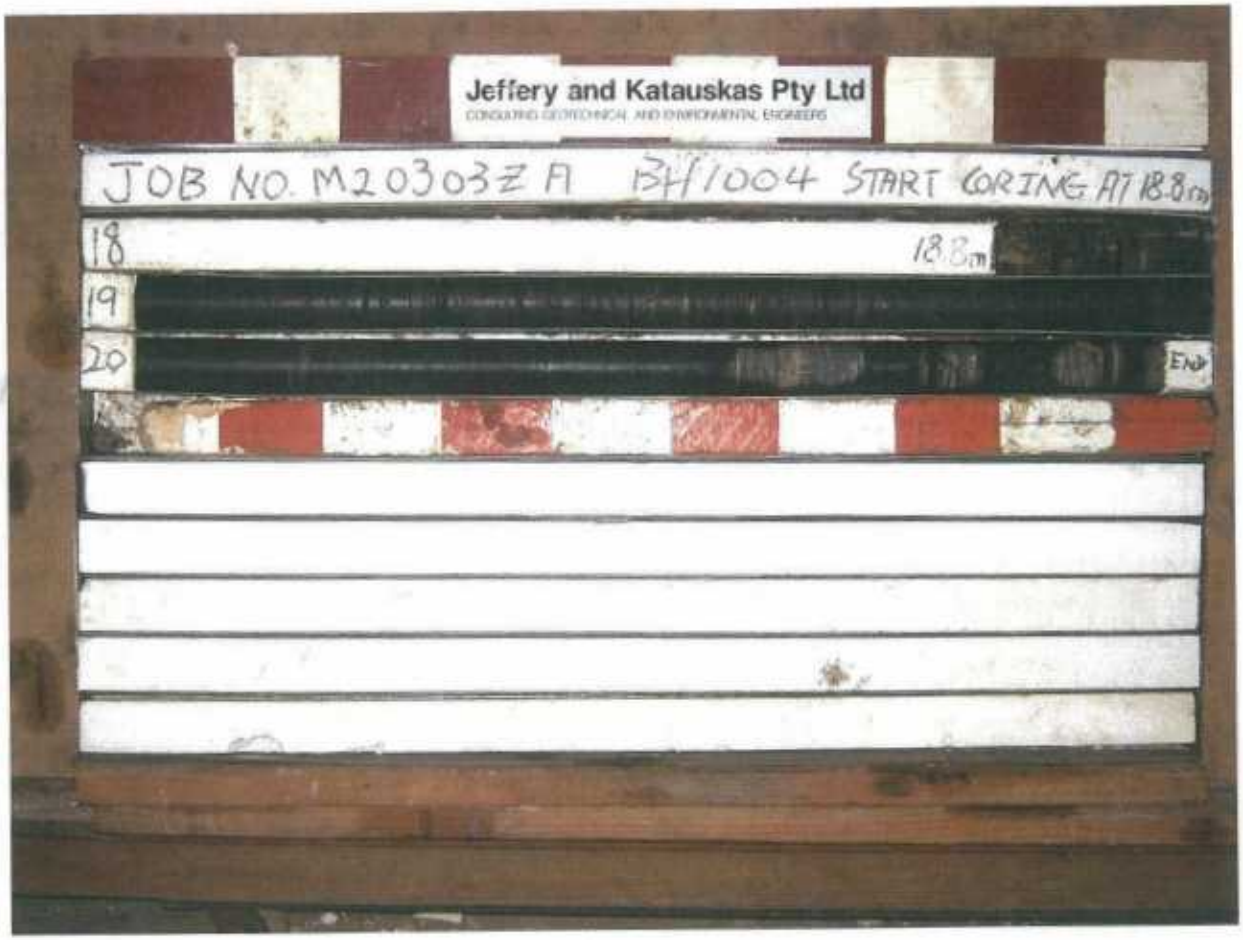
Borehole No. **1004** 3/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE
Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT
Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000
Date: 1-6-06 **Datum:**
Logged/Checked by: M.T./AJ

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SP	SAND: fine to coarse grained, brown and grey.	W	-		CONTINUOUS WASHBORE DRILLING (ie NO INSITU TESTING) FROM 12.5m DOWN TO 18.8m IN ORDER TO PROVE BEDROCK
						15			SAND: fine to coarse grained, dark grey.				
						16							
						17							
						18							
						19			REFER TO CORED BOREHOLE LOG				
						20							


Jeffery and Katauskas Pty Ltd
JOB NO. M20303Z A BH1004 START CORING AT 18.8m
18
18.8m
19
20
END

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1004** 4/4

CORED BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Core Size:** NMLC **R.L. Surface:**

Date: 1-6-06 **Inclination:** VERTICAL **Datum:**

Drill Type: EDSON 3000 **Bearing:** - **Logged/Checked by:** M.T./ASH

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		18		START CORING AT 18.80m					
FULL RET-URN		19		SHALE: dark grey, with fine grained, light grey sandstone laminae, bedded at 0°-5°, spacing up to 20mm.	Fr	H M-H	× × ×		- Cr, 3mm.t - Cr, 5mm.t - XWS/Cr, 7mm.t - XWS/Cr, 10mm.t - Cr, 10mm.t - XWS/Cr, 8mm.t
		20		as above, but spacing up to 5mm.		H	×		
		21		END OF BOREHOLE AT 20.95m					
		22							
		23							
		24							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1005 1/5

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 2-6-06 TO 7-6-06 **Datum:**

Logged/Checked by: M.T./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty gravelly sand, fine to medium grained, dark grey, fine to coarse grained angular concrete and igneous gravel.	D MC<PL			
					N = 15 5,7,8	1		CH	FILL: Silty clay, high plasticity, dark grey and yellow brown, with igneous gravel.	MC<PL	H	420 460 480	ALLUVIAL
					N = 23 5,11,12			CH	SILTY CLAY: high plasticity, orange brown and light grey, with a trace of root fibres. SANDY CLAY: high plasticity, orange brown and light grey, with a trace of root fibres.			>600 >600 >600	
					N > 28 12,18, 10/20mm END	2		SC	CLAYEY SAND: fine to medium grained, light grey and yellow brown.	M	D		
					N > 27 12,15, 12/60mm END	3		SP	SAND: fine grained, light brown.				
						4							
						5		SC	CLAYEY SAND: fine to medium grained, light grey, yellow brown and light brown.		MD		
					N = 23 10,11,12	6			as above, but yellow brown, light grey and red brown.				
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1005 2/5

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 2-6-06 TO 7-6-06 **Datum:**

Logged/Checked by: M.T./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SC	CLAYEY SAND: fine to coarse grained, light grey and orange brown, with sandy clay bands.	M	MD		
▶					N = 26 9,10,16					W			
						8							
						9							
						10							
					N = 13 3,6,7			CL	SILTY CLAY: medium plasticity, light grey, with fine to medium grained sand.	MC>PL	VSt-H	390 450 420	
						11							
					N = 11 3,4,7	12			as above, but light grey and dark grey.		VSt	320 340 300	
						13		SP	SAND: fine to medium grained, dark grey and light grey.	W	-		COMMENCE ROTARY WASHBORE DRILLING
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1005** 3/5

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 2-6-06 TO 7-6-06 **Datum:**

Logged/Checked by: M.T./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								CL	SILTY CLAY: medium plasticity, dark grey and light grey, with a trace of organic matter.	MC>PL			CONTINUOUS WASHBORE DRILLING (ie NO INSITU TESTING) FROM 12.45m DOWN TO 21.55m DEPTH IN ORDER TO PROVE BEDROCK
						15							
						16							
						17		SP	SAND: fine to medium grained, brown, with clay bands.	W			
						18							
						19							
						20							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1005** 4/5

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

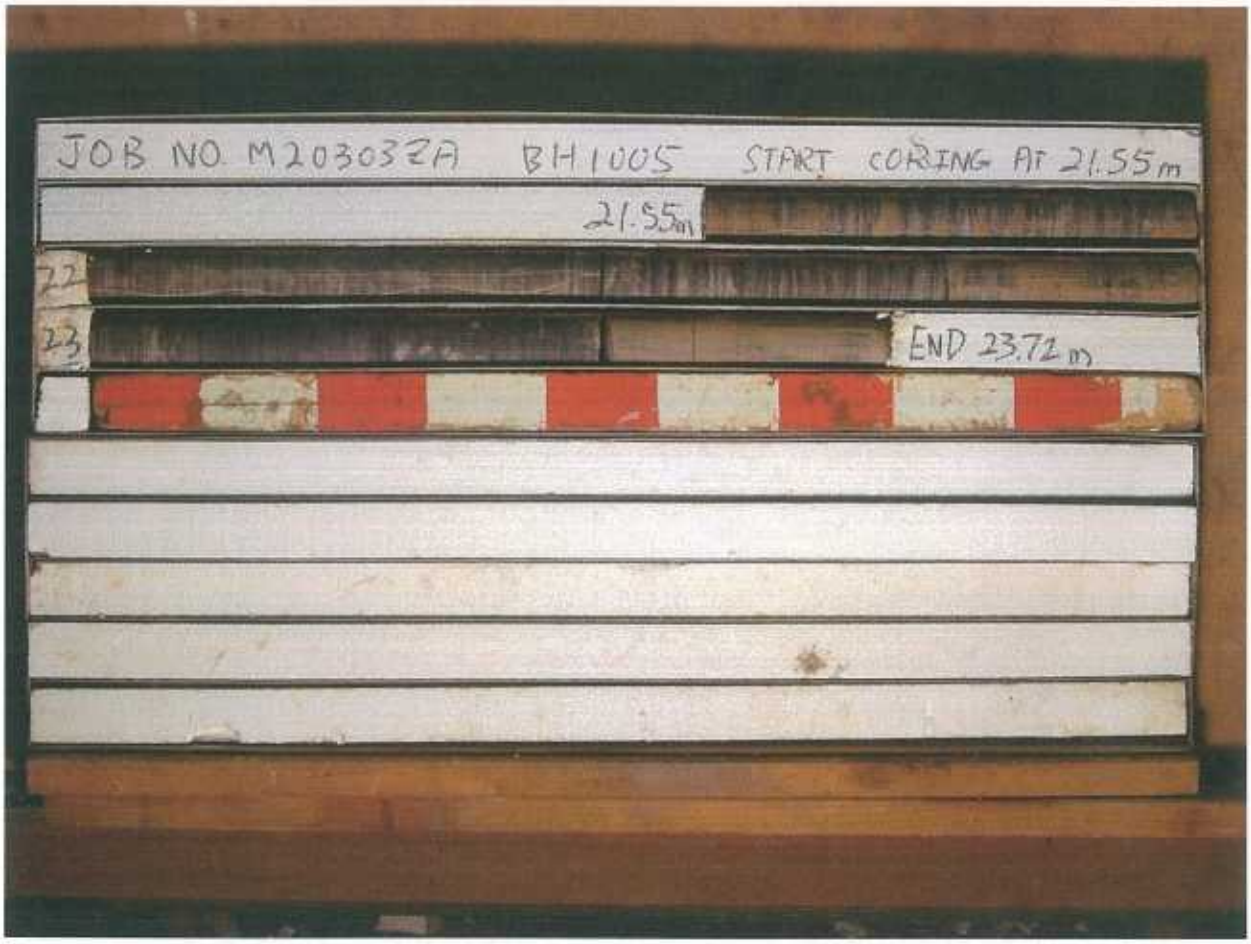
Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 2-6-06 TO 7-6-06 **Datum:**

Logged/Checked by: M.T./[illegible]

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SP	SAND: fine to medium grained, brown, with clay bands.	W	-		
									REFER TO CORED BOREHOLE LOG				
						22							
						23							
						24							
						25							
						26							
						27							


JOB NO. M203032A BH1005 START CORING AT 21.55m
21.55m
22
23
END 23.72m

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1005** 5/5

CORED BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Core Size:** NMLC **R.L. Surface:**

Date: 7-6-06 **Inclination:** VERTICAL **Datum:**

Drill Type: EDSON 3000 **Bearing:** - **Logged/Checked by:** M.T./AJH

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		20							
		21		START CORING AT 21.55m					
FULL RET-URN		22		SHALE: dark grey, with fine grained, light grey sandstone laminae, bedded at 0°-5°, spacing up to 10mm.	Fr	H	× × × ×		
		23				M-H			
		24		END OF BOREHOLE AT 23.72m					
		25							
		26							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1006 1/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 31-5-06 **Datum:**

Logged/Checked by: M.T./ASI

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGER-ING						0			FILL: Silty clay, medium plasticity, dark brown, with root fibres and concrete fragments and a trace of igneous gravel.	MC<PL			GRASS COVER APPEARS WELL COMPACTED
					N = 25 11,11,14				as above, but light grey and brown, with no concrete fragments.				
						1		CH	SILTY CLAY: high plasticity, red and brown, with a trace of root fibres and ironstone gravel.	MC<PL	H	-	ALLUVIAL
					N > 28 9,17, 11/50mm END				as above, but light grey and yellow brown.			>600 >600 >600	
						2							
								SC/CH	CLAYEY SAND/SANDY CLAY: fine to medium grained, high plasticity, light grey and brown.	MC<PL/ M	H/ D		
					N > 27 12,20, 7/40mm END	3						>600 >600 >600	
								SP	SAND: fine to medium grained, yellow brown, with a trace of clay fines.	M	D		
						4							
					N > 24 8,18,6/ 20mm END								
						5							
								SC	CLAYEY SAND: fine to coarse grained, red brown, with ironstone gravel and clay bands.				
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1006** 2/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 31-5-06 **Datum:**

Logged/Checked by: M.T./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								CH	SILTY CLAY: high plasticity, light grey and orange brown, with a trace of fine to medium grained sand, ironstone gravel and root fibres.	MC<PL	H		
					N = 25 3,9,16							>600 >600 >600	
						8							
					N > 32 9,16, 16/80mm							>600 >600 >600	
					END	9							COMMENCE ROTARY WASHBORE DRILLING
						10		SP	SAND: fine to medium grained, brown.	W	-		CONTINUOUS WASHBORE DRILLING (ie NO INSITU TESTING) FROM 8.93m DOWN TO 15.75m DEPTH IN ORDER TO PROVE BEDROCK
						11							
						12							
									SAND: fine to coarse grained, grey and brown, with occasional ironstone gravel bands.				
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1006 3/4

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER & WASHBORING **R.L. Surface:**
EDSON 3000

Date: 31-5-06 **Datum:**

Logged/Checked by: M.T./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						15		SP	SAND: fine to coarse grained, grey and brown, with occasional ironstone gravel bands.	W	-		
						16		-	SHALE: dark grey, with occasional clay bands.	XW-DW SW-Fr	EL-VL L-M	-	
						17			REFER TO CORED BOREHOLE LOG				
						18							
						19							
						20							


Jeffery and Katauskas Pty Ltd
JOB NO. M20303ZA BH1006 START CORING AT 16.90m
16
16.90m
17
18
19
END 19.9m

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1006** 4/4

CORED BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Core Size:** NMLC **R.L. Surface:**

Date: 1-6-06 **Inclination:** VERTICAL **Datum:**

Drill Type: EDSON 3000 **Bearing:** - **Logged/Checked by:** M.T. MSH

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		15							
		16		START CORING AT 16.90m					
FULL RET-URN		17		SHALE: dark grey, with fine grained, light grey sandstone laminae, bedded at 0-5°, spacing up to 5mm.	Fr	M-H	×		- Cr, 5mm.t
		18				H	× ×		- Cr, 15mm.t - Cr, 4mm.t
		19					×		- Cr, 14mm.t
		20		END OF BOREHOLE AT 19.90m			×		
		21							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 1007
1/2

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

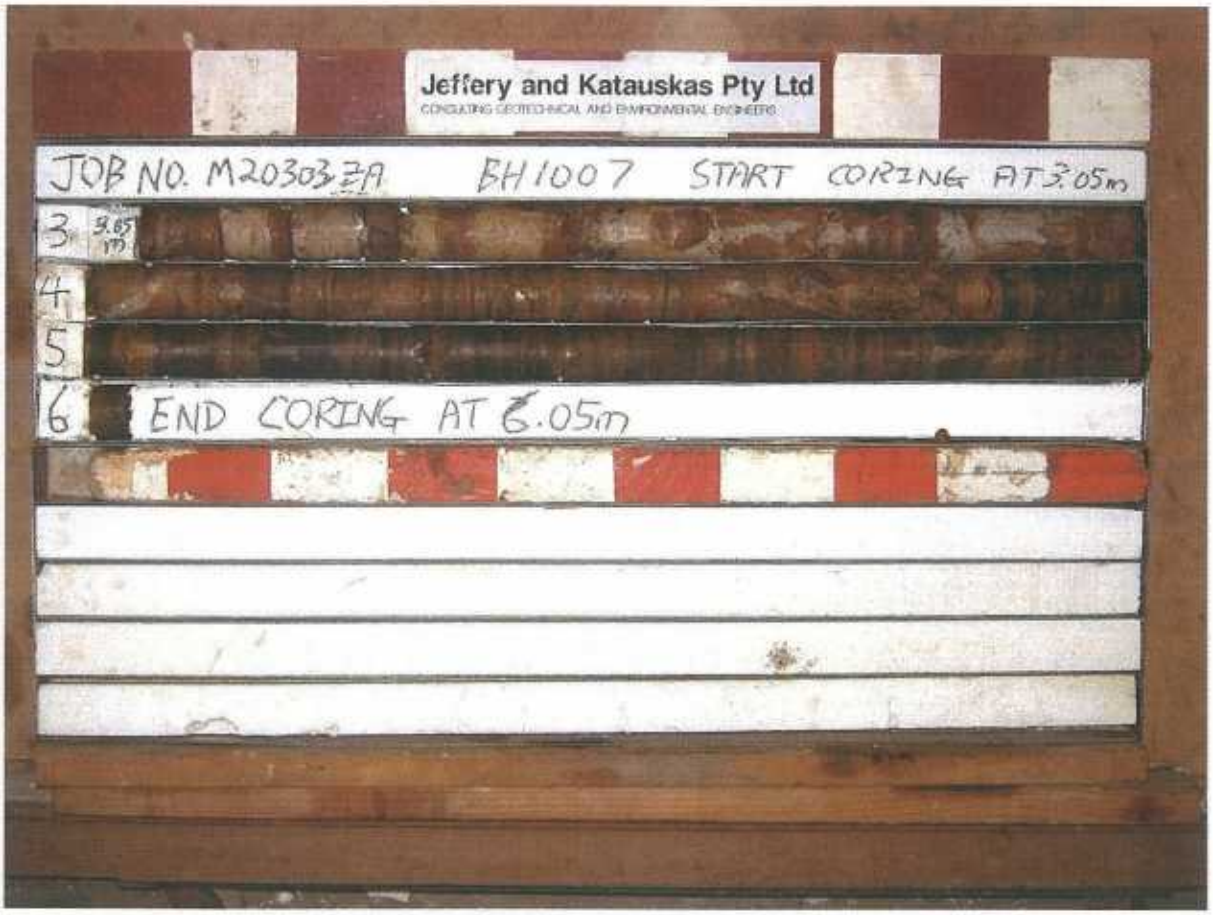
Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER EDSON 3000 **R.L. Surface:**

Date: 30-5-06 **Datum:**

Logged/Checked by: M.T./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLET -ION OF AUGER- ING						0		-	BRICK: 50mm.t FILL: Gravelly silty clay, high plasticity, dark brown, fine to coarse grained angular igneous gravel.	MC < PL	-	-	
					N = 14 4,7,7			CH	SILTY CLAY: high plasticity, red brown, with ironstone gravel.	MC < PL	H	- > 600 > 600 > 600	RESIDUAL
					N > 33 10,14, 19/110mm	1			as above, but light grey, red brown and brown.			> 600 > 600 > 600	
					END	2		-	SHALE: light grey, dark brown and dark grey.	DW	M	-	
						3			REFER TO CORED BOREHOLE LOG				
						4							
						5							
						6							
						7							


Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
JOB NO. M20303ZA BH1007 START CORING AT 3.05m
3 3.05 m
4
5
6
END CORING AT 6.05m

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1007** 2/2

CORED BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Core Size:** NMLC **R.L. Surface:**

Date: 30-5-06 **Inclination:** VERTICAL **Datum:**

Drill Type: EDSON 3000 **Bearing:** - **Logged/Checked by:** M.T./KJ

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		2							
		3		START CORING AT 3.05m					
FULL RET-URN		4		INTERBEDDED SHALE: light brown, with crushed seams and SILTY CLAY: medium plasticity, light grey.	DW/ MC<PL	L-M/ (VSt)	×		
					XW/ MC<PL	EL/ (VSt)			
				SHALE: brown and grey brown, bedded at 0°-5°.	XW	EL			J, SUBVERTICAL, Un, R J, SUBVERTICAL, P, R
		5			DW	M	× ×		XWS, 25mm.t CS, 5mm.t XWS, 15mm.t XWS, 40mm.t
		6					×		XWS, 10mm.t XWS, 5mm.t
				END OF BOREHOLE AT 6.05m					
		7							
		8							
		9							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1008 1/2

BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Method:** SPIRAL AUGER JK250 **R.L. Surface:**

Date: 2-6-06 **Datum:**

Logged/Checked by: A.J./AJ

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLET -ION OF AUGER- ING					N = 10 3,5,5	0			FILL: Silty sand, fine to medium grained, dark brown, with fine to coarse grained sub angular sandstone gravel, with a trace of clay nodules, coarse grained angular slag gravel and brick fragments.	M			GRASS COVER
						1			FILL: Silty clay, high plasticity, dark brown and various colours, with a trace of fine to medium grained sub angular sandstone and igneous gravel and fine to medium grained sand.	MC < PL			APPEARS MODERATELY COMPACTED
					N = 25 9,10,15								
						2		CH	SILTY CLAY: high plasticity, orange brown mottled light grey and red brown.	MC < PL	H	>600 >600	RESIDUAL
					N = 13 3,6,7	3		CL	SILTY CLAY: medium plasticity, light grey mottled orange brown and red brown, with a trace of fine to medium grained sub angular ironstone gravel.	MC > PL	St -VSt	320 140 270	
						4		-	as above, but with ironstone gravel bands.				
								-	SHALE: dark grey and dark brown.	DW	L	-	LOW 'TC' BIT RESISTANCE
						5			REFER TO CORED BOREHOLE LOG				
						6							
						7							


Jeffery and Katauskas Pty Ltd
Job No. M20303ZA BH1008 Start Coring at 4.56m
Core Loss 0.05m
5
Core Loss 0.1m
6
End of Borehole at 7.0m

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1008** 2/2

CORED BOREHOLE LOG

Client: NSW DEPARTMENT OF COMMERCE

Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT

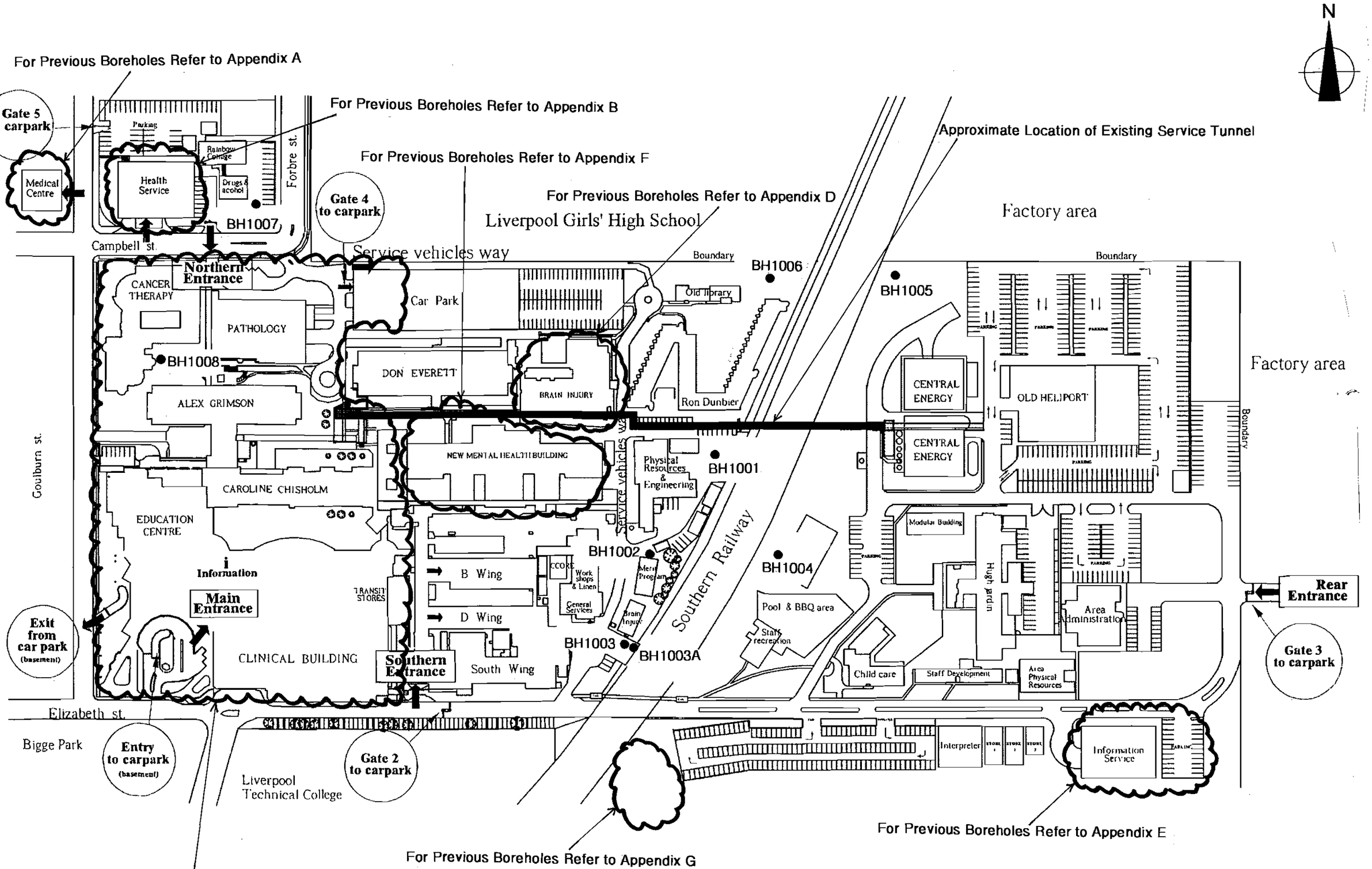
Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA **Core Size:** NMLC **R.L. Surface:**

Date: 2-6-06 **Inclination:** VERTICAL **Datum:**

Drill Type: JK350 **Bearing:** - **Logged/Checked by:** A.J./KSH

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		4		START CORING AT 4.56m					
FULL RET-URN		5		CORE LOSS 0.05m SHALE: dark brown with dark grey and grey seams, bedded at 0-5°.	DW	L-M	× × ×		- CS, 40mm.t - XWS, 50mm.t - J, 80°, P, S - XWS/CS, 50mm.t - XWS, 10mm.t - Cr, 20mm.t - Be, 0°, P, R, CLAY COATED - Cr, 15mm.t - J, 30°, P, S - CS/XWS, 40mm.t
		6		CORE LOSS 0.14m SHALE: dark brown, with dark grey seams, bedded at 0-5°.	DW	L-M	× × ×		- CS/Cr, 40mm.t - CS, 15mm.t - XWS, 20mm.t - Cr/XWS, 40mm.t - XWS/CS, 70mm.t - XWS, 20mm.t
		7		END OF BOREHOLE AT 7.00m					
		8							
		9							
		10							



BOREHOLE LOCATION PLAN

SCALE
0 100m

Jeffery and Katauskas Pty Ltd
Report No. M20303ZA Figure No. 1

APPENDIX A

Borehole Logs and Borehole Location Plan from Previous Report, Ref: 7088K dated 13 October 1989

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 1

BOREHOLE LOG

Client:

Project: PROPOSED DAY SURGERY.

Location: 33-35 GOULBURN STREET, LIVERPOOL.

Job No. 7088K | Method: SPIRAL AUGER HYDRAPOWER. | R.L. Surface: 18.8

Date: 3-10-89 | Datum: ASSUMED

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION						FILL: Sandy Silty Clay, low to medium plasticity, with some gravel and ashes, dark brown.				APPEARS POORLY COMPACTED.
					CH	SILTY CLAY: high plasticity, reddish brown.	MC<PL	Vst.		
						becoming grey and red mottled.	MC<PL	Vst to H.	330 390 420 480	
	DS	N>20 5, 14, 6/120mm	1		CL	CLAY: low plasticity, grey with some shale bands and ironstone bands; grey.				
	DS	HAMMER BOUNCING			CL	SILTY CLAY: low plasticity, grey and red mottle, some ironstone gravel.				
			2							
	DS	N=20 3, 8, 12			CL	CLAY: low plasticity grey with some shale and ironstone bands.			550 520 580 550	
	DS		3							ESTIMATED 'V' BIT REFUSAL.
						SHALE: grey and reddish brown, extremely weathered, very weak, with some extremely weathered ironstone bands and clay bands.				LOW 'TC' BIT RESISTANCE.
	DS		4							
						END OF BOREHOLE AT 4.5m				
			5							
			6							
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 2

BOREHOLE LOG

Client:

Project: PROPOSED DAY SURGERY.

Location: 33-35 GOULBURN STREET, LIVERPOOL.

Job No. 7088K | Method: SPIRAL AUGER | R.L. Surface: 18·0.

Date: 3-10-89 | HYDRAPOWER. | Datum: ASSUMED

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer kPa.	Remarks
						FILL: Silty, Sandy Clay, low to medium plasticity, with some gravels and ashes.	MC < PL			APPEARS POORLY COMPACTED.
					CH	SILTY CLAY: high plasticity, reddish brown and grey with some ironstone bands.	MC < PL	Vst to H.		
	DS	N > 30 4, 11, 19/135mm	1		CL	CLAY: with some shale bands and ironstone bands, grey and red mottling.	MC < PL		550 540 570 550	
	DS									
	DS		2			as above but no shale and ironstone bands, grey.				
	DS		3							ESTIMATED V'BIT REFUSAL.
						SHALE: brown and grey, extremely to highly weathered, very weak with some ironstone bands and clay bands.				LOW TC'BIT RESISTANCE WITH MODERATE BANDS.
▼ AFTER 1 HOUR.			4			as above but highly weathered, weak with cemented sandstone bands and ironstone bands, some clay bands.				LOW TO MODERATE RESISTANCE.
	DS					END OF BOREHOLE AT 4·5m.				
			5							
			6							
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 3

BOREHOLE LOG

Client:

Project: PROPOSED DAY SURGERY.

Location: 33-35 GOULBURN STREET, LIVERPOOL.

Job No. 7088K | Method: SPIRAL AUGER HYDRAPOWER. | R.L. Surface: 17·1

Date: 3-10-89 | Datum: ASSUMED

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION					CH	SILTY CLAY: high plasticity, reddish brown, with some ironstone gravel.	MC<PL	st.		
	DS	N=13 3, 6, 7	1		CL	CLAY: low plasticity, with some shale and ironstone bands, brown and grey mottle.	MC<PL	V st.	220 250 260 250	
			2							ESTIMATED V'BIT REFUSAL.
						SHALE: brown and grey, extremely to highly weathered, very weak to weak with some ironstone bands and clay bands.				LOW TO MODERATE 'TC' BIT RESISTANCE
	DS		3			as above but weak, dark grey.				MODERATE RESISTANCE.
			4			SHALE: dark grey, extremely to highly weathered, very weak to weak with some ironstone and clay bands.				LOW RESISTANCE
	DS									LOW TO MODERATE RESISTANCE
						END OF BOREHOLE AT 4.6m				
			5							
			6							
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 4

BOREHOLE LOG

Client:

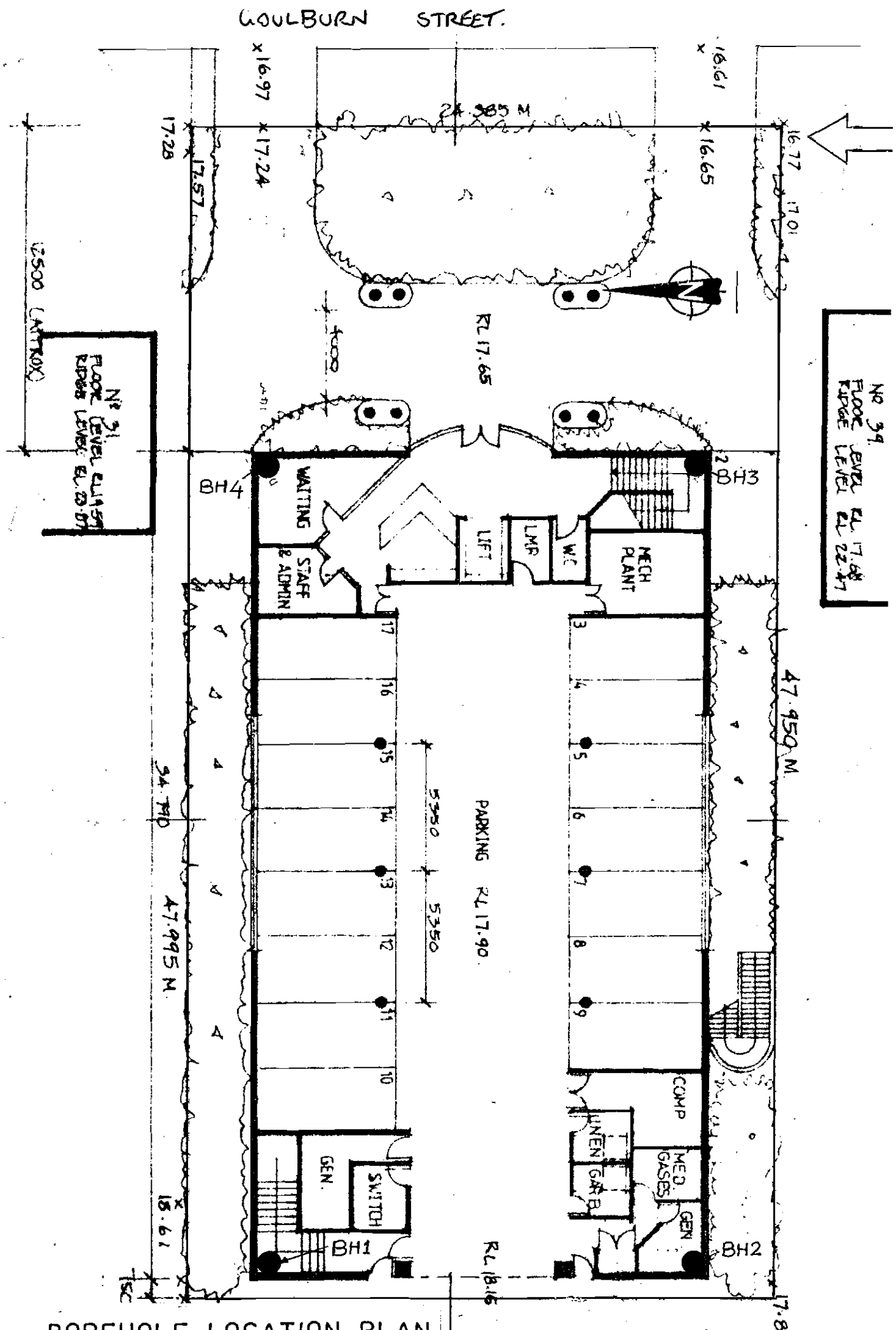
Project: PROPOSED DAY SURGERY.

Location: 33-35 GOULBURN STREET, LIVERPOOL.

Job No. 7088K | Method: SPIRAL AUGER HYDRAPOWER. | R.L. Surface: 17.8

Date: 3-10-89 | Datum: ASSUMED

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer kPa.	Remarks
DRY ON COMPLETION.						FILL: Silty Sandy Clay, low to medium plasticity, with some gravels, ashes dark brown.	MC<PL			APPEARS POORLY COMPACTED.
					CH.	SILTY CLAY: high plasticity, reddish brown.	MC<PL	Vst.		
	DS	N>5 10,3 120mm HAMMER BOUNCING.	1		CL	CLAY: low plasticity, with some shale and ironstone bands grey and red mottle.		Vst to H.		SAMPLE FRIABLE.
	DS		2							
	DS					SHALE: grey and brown, extremely weathered, extremely weak to very weak with some iron indurations and clay bands.				LOW 'TC' BIT RESISTANCE
	DS		3			as above but highly weathered, very weak with ironstone bands and clay bands.				LOW TO MODERATE RESISTANCE
						as above but weak to medium strong.				MODERATE TO HIGH RESISTANCE.
	DS		4							MODERATE RESISTANCE.
						END OF BOREHOLE AT 4.5m.				
			5							
			6							
			7							



BOREHOLE LOCATION PLAN

SCALE 1:200

Jeffery and Katauskas Pty Ltd

Report No. 7088K Figure No. 1

APPENDIX B

Borehole Logs and Borehole Location Plan from Previous Report, Ref: 7104J dated 2 November 1989

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. /

BOREHOLE LOG

Client:

Project: PROPOSED HEALTH SERVICE BUILDING

Location: CNR. CAMPBELL STREET AND GOULBURN STREET, LIVERPOOL. N.S.W.

Job No. 7104 J

Method: SPIRAL AUGER

Date: 18 - 10 - 89

G.C.H. RIG.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION AND AFTER 2½ HOURS	DS					TOPSOIL: Clayey Sand, fine grained, brown with some roots.	D			
					CL-CH	CLAY: medium to high plasticity, light grey mottled red with some ironstone gravels.	MC≈PL			
	DS	N = 12 4,5,7	1					H		
									500 450	
	DS				CL	SHALEY CLAY: medium plasticity, grey white.				
	DS					SHALE: extremely weathered, extremely weak, brown with some clay bands.				
	DS	15/150mm AND BOUNCING	2							ESTIMATED 'V' BIT REFUSAL.
						INTERBEDDED SANDSTONE & SHALE: fine grained, highly weathered, weak, dark brown and grey.				MODERATE 'TC' BIT RESISTANCE WITH LOW BANDS. MOD. TO HIGH.
	DS		3							
	DS					SANDSTONE: fine grained, moderately weathered, medium strong to strong, grey.				HIGH RESISTANCE.
	DS									'TC' BIT REFUSAL.
						END OF BOREHOLE AT 3.6m.				
			4							
			5							
			6							
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 2

BOREHOLE LOG

Client:

Project: PROPOSED HEALTH SERVICE BUILDING

Location: CNR. CAMPBELL STREET AND GOULBURN STREET, LIVERPOOL. N.S.W.

Job No. 7104 J Method: SPIRAL AUGER

Date: 18 - 10 - 89 G.C.H. RIG.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION AND AFTER 1½ HOURS	DS					TOPSOIL: Clayey Sand, fine grained, brown with some roots and organic fibres.	D			
	DS						D			
					CL-CH	FILL: Sand, with some crushed sandstone gravel.	Mc≈PL	H.		
	DS	N = 16 3, 6, 10	1			CLAY: medium to high plasticity, light grey mottled red			550 600 550	
						——— as above but with some ironstone gravels.				
	DS				CL	SILTY CLAY: medium plasticity, light grey with some fine grained sand.				ESTIMATED 'V' BIT REFUSAL.
	DS		2			INTERBEDDED SANDSTONE & SHALE: highly to moderately weathered, weak to medium strong, fine grained, dark brown and grey.				LOW TO MODERATE TC BIT RESISTANCE WITH LOW BANDS. MODERATE RESISTANCE WITH MODERATE BAND.
	DS		3			SANDSTONE: fine grained, moderately to slightly weathered, medium strong to strong, grey.				HIGH RESISTANCE. WITH MODERATE BAND.
	DS		4							MODERATE RESISTANCE.
	DS		5							HIGH RESISTANCE.
	DS									
			6			END OF BOREHOLE AT 5.5m.				TC BIT REFUSAL.
			7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 3

BOREHOLE LOG

Client:
Project: PROPOSED HEALTH SERVICE BUILDING
Location: CNR. CAMPBELL STREET AND GOULBURN STREET, LIVERPOOL. N.S.W.

Job No. 7104 J
Date: 18 - 10 - 89
Method: SPIRAL AUGER
G.C.H. RIG.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						TOPSOIL: Clayey Sand, fine grained, brown with some roots and organic fibres.	D			
	DS				CH	FILL: Sand and gravel, with some organic fibres.	MC≈PL	Vst.		
	DS	N = 18 3, 4, 14	1			CLAY: high plasticity, orange brown mottled red.			300 400 330	
						— — — as above but light grey mottled red with ironstone gravel.				
	DS				CL	SILTY CLAY: medium plasticity, light grey and brown with some ironstone gravel.				
AFTER 1 HR.			2							
	DS	N >> 30 8, 20, 10/50mm				SHALE: extremely weathered, extremely weak grey with some clay bands and some ironstone zones.				ESTIMATED 'V' BIT REFUSAL.
		AND BOUNCING	3			— — — as above. but highly weathered, weak grey with some ironstone bands.				LOW 'TC' BIT RESISTANCE WITH LOW BANDS.
	DS		4							
			5			— — — as above but moderately weathered, weak, dark grey.				LOW RESISTANCE WITH LOW TO MODERATE BANDS. MODERATE RESISTANCE WITH LOW BANDS.
	DS									MODERATE TO HIGH RESISTANCE
			6			END OF BOREHOLE AT 6.0m.				
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 4

BOREHOLE LOG

Client:

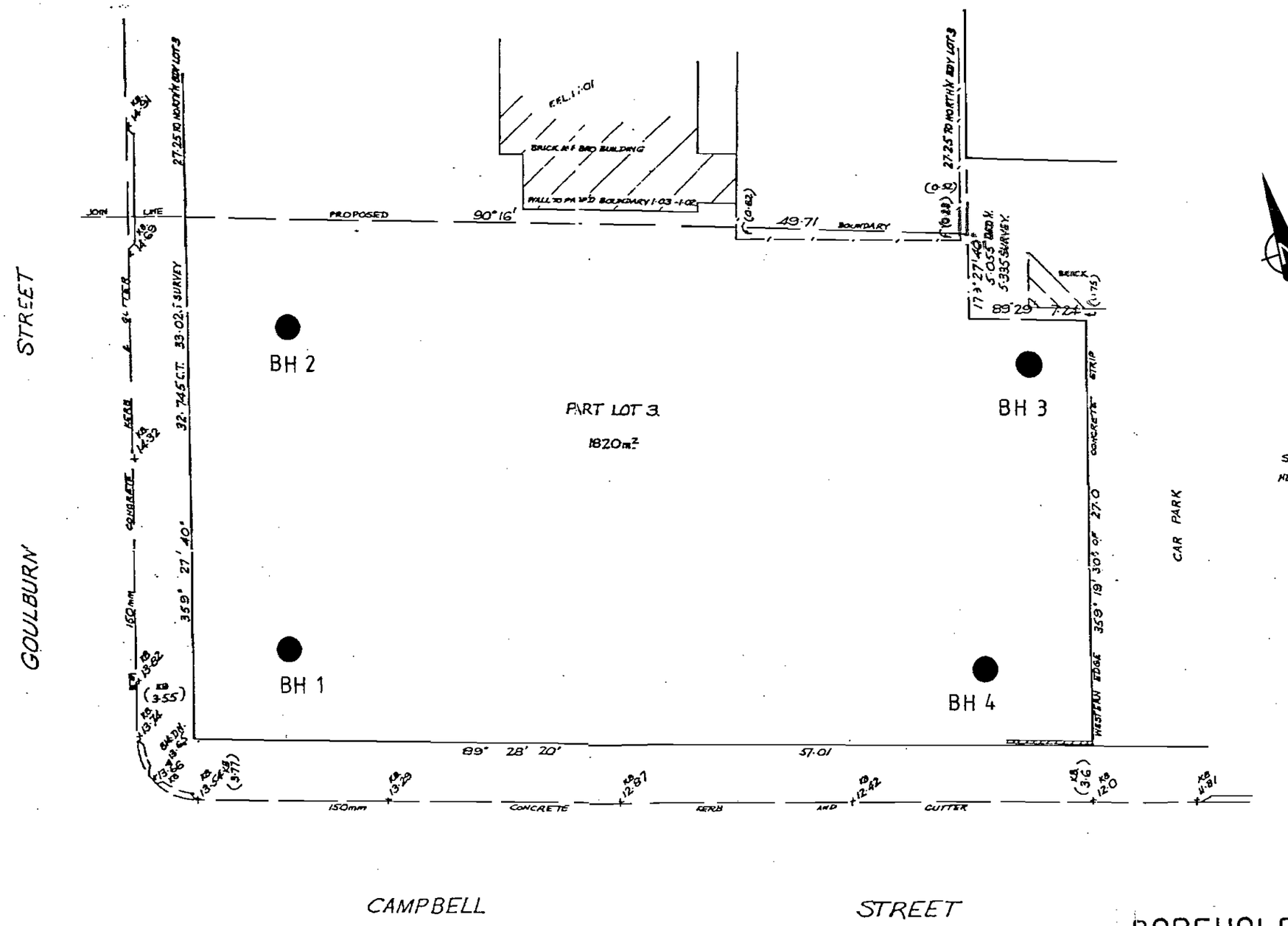
Project: PROPOSED HEALTH SERVICE BUILDING

Location: CNR. CAMPBELL STREET AND GOULBURN STREET, LIVERPOOL. N.S.W.

Job No. 7104 J Method: SPIRAL AUGER

Date: 18 - 10 - 89 G.C.H. RIG.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer kPa.	Remarks
	DS					TOPSOIL: Clayey Sand, fine grained, brown, with some roots.	D			
							D			
	DS				CH	FILL: Clayey Sand with some gravel.	MC≈PL	H		
						CLAY: high plasticity, red brown mottled yellow brown.				
	DS	N = 23 8, 11, 12	1			as above light grey mottled red.			>600 >600 >600	
	DS					as above but with ironstone gravel.				
	DS		2			INTERBEDDED SANDSTONE & SHALE: highly weathered, weak, fine grained, dark brown with iron staining and clay bands.				LOW 'TC' BIT RESISTANCE
	DS		3							LOW TO MODERATE RESISTANCE.
			4			as above but moderately weathered, weak to medium strong.				MODERATE TO HIGH RESISTANCE WITH LOW BANDS
▼ AFTER ¼ HR.	DS		5							LOW RESISTANCE WITH MODERATE TO HIGH BANDS.
			6			END OF BOREHOLE AT 6.0m.				
			7							



BOREHOLE LOCATION PLAN

SCALE 0 10m

Jeffery and Katauskas Pty Ltd

Report No. 7104 J Figure No. 1

APPENDIX C

Borehole Logs and Borehole Location Plan from Previous Report, Ref: 8471W dated November 1991

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 1 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·3m.

Date: 16 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						Grass over FILL/TOPSOIL: Sandy Silty Clay, low plasticity, brown.	MC<PL			PVC CAP CONCRETE APPEARS POORLY COMPACTED.
BEFORE DRILLING						FILL: Clay, medium to high plasticity, pale grey and brown.	MC>PL			
	DS	N=6 4, 3, 3	1		CL-CH	CLAY: medium to high plasticity, orange brown and pale grey. Zones containing some fine ironstone gravel.	MC>PL	St to Vst.		ALLUVIUM. PVC STAND PIPE NB. STAND-PIPE INSTALLED APPROX. 2m TO THE NORTH-EAST.
	DS									
			2					Vst.	300 350 340 360	
	DS	N=13 3, 5, 8								
			3							BACKFILL
	DS	N=12 4, 5, 7	4						370 300 340 310	
			5		CL	SILTY CLAY: medium plasticity, pale grey and yellow brown. Bands of sandy silty clay.		H.	300 330 550 >600	
	DS	N=23 5, 9, 14								
			6							
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 1 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10.3m.

Date: 16 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
					CL	SILTY CLAY: medium plasticity, pale grey, and yellow brown.	MC>PL	H.		SAND BACKFILL
			8							SLOTTED ZONE WRAPPED IN GEOTEXTILE
			9							ESTIMATED 'V' BIT REFUSAL.
						SHALE: grey and brown, highly weathered, very low to weak with medium strong bonds.	(CLASS 4)			BANDED LOW AND MODERATE RESISTANCE
						as above but dark grey, slightly weathered, strong.	(CLASS 2)			MODERATE 'TC' BIT RESISTANCE
			10			REFER TO CORED BOREHOLE LOG.				
			11							
			12							
			13							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 1 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No: 8471W
Date Drilled: 16 - 10 - 91
Drill Type: G.C.H. RIG.

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≑ 10·3m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		9		START CORING AT 9·89m.					
FULL RETURN		10		SHALE: dark grey with pale grey, fine grained sandstone laminae.	SW	MS/S	×	(CLASS 1)	BEDDING PARTINGS 0°-5°, PLANAR, SMOOTH.
		11					×		
		12		END OF BOREHOLE AT 11·99m					
		13							
		14							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 2 1/2

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 11·1m.

Date: 15 - 10 - 91 INTERTECH BCD 450 Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION OF AUGERING.						CONCRETE: 120mm thick (reinforced) FILL: Silty Clay, low to medium plasticity, brown.				APPEARS POORLY TO MODERATELY COMPACTED.
	DS				CL	SILTY CLAY: low to medium plasticity, brown.	MC>PL	F - st.		RESIDUAL
	DS	N = 7 2, 3, 4	1		CL-CH	CLAY: medium to high plasticity, pale grey and red brown.		Vst.	340 320 360.	
	DS	N > 25 9, 13, 12/90mm	2		CL	SHALY CLAY: low to medium plasticity, pale grey. Abundant ironstone and siltstone bands. Some bands of extremely and very weak shale.	MC<PL	H.	>600 >600 >600	ESTIMATED 'V' BIT REFUSAL ON WEAK BANDS. (CLASS 5)
	DS	N > 17 13, 17/130mm	3							
			4						>600 >600.	
	DS		5			SHALE: grey brown, grey and brown, highly weathered, very weak to weak. Some extremely weak zones.	(CLASS 4)			LOW 'TC' BIT RESISTANCE WITH MODERATE BANDS.
	DS					as above but dark grey, slightly weathered and strong.	(CLASS 1)			MODERATE RESISTANCE.
			6			REFER TO CORED BOREHOLE LOG.				
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 2 2/2

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471W
Date Drilled: 15 - 10 - 91
Drill Type: INTERTECH BCD 450
Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —
R. L. Surface: ≒ 11.1m
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		5		START CORING AT 5.68m.					
		6		SHALE: dark grey with pale grey, fine grained sandstone laminae.	SW	MS/S	×		— EW SEAM, 3mm.
		7					×	(CLASS 1)	NB. DEFECTS ARE BEDDING PARTINGS, 0°- 10°, PLANAR, SMOOTH.
		8		END OF BOREHOLE AT 7.88m.					
		9							
		10							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 3 1/2

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 11.5m.

Date: 16 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPL-TION OF AUG-ERING						CONCRETE : 140mm thick (shrinkage reinforced)				APPEARS MODERATELY COMPACTED.
						FILL : Sand, coarse grained, brown.				
					CL-CH	FILL : Sandy Clay, shale pieces and pozzalon ash.	MC>PL	st to Vst.		RESIDUAL
	DS	N=5 1,2,3	1			CLAY : medium to high plasticity, pale grey and red brown.			220 300 290.	
					CL	SHALY CLAY : medium plasticity, pale grey and orange. Abundant ironstone seams. Some pale grey claystone seams.				(CLASS 5)
	DS	N>15 15,15/110mm	2						>600 >600	ESTIMATED 'V' BIT REFUSAL.
			3			SHALE : grey, extremely weathered, extremely weak. Abundant ironstone seams.	(CLASS 5)			LOW 'TC' BIT RESISTANCE (CLASS 5)
	DS					as above but grey brown, highly weathered, very weak to weak, occasional ironstone seams.	(CLASS 4)			BANDED LOW & MODERATE RESISTANCE (CLASS 4)
	DS		4			as above but grey and brown, moderately weathered, medium strong.	(CLASS 3/4)			MODERATE RESISTANCE. (CLASS 3/4)
			5			REFER TO CORED BOREHOLE LOG.				
			6							
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 3 2/2

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 16 - 10 - 91
Drill Type: INTERTECH BCD450

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 11·5m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific	General
		4		START CORING AT 4·40m.						
				CORE LOSS 0·07m.						
FULL RETURN		5		SHALE: brown and grey, with pale grey fine grained sandstone laminae.	MW	MS		(CLASS 4)	JOINT, 70°-80°, CURVED, SMOOTH.	
									CLAY SEAM, 25-30mm.	
									JOINT, 80-90°, CURVED, SMOOTH.	
					MW-SW	MS-S.	×	(CLASS 2/1)	EW SEAM, 10mm.	
									JOINT, 75°-80°, PLANAR, SMOOTH.	
		6					×		EW SEAM, 5 - 10mm.	
				END OF BOREHOLE AT 6·5m.						
		7								
		8								
		9								

NB. DEFECTS NOT LABELLED ARE BEDDING PARTINGS 0°-10°, PLANAR, SMOOTH.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 4 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·1m

Date: 16 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						BITUMEN : 10mm thick. FILL: Crushed basalt 50mm. FILL : Ripped sandstone 400mm thick.				
	DS				CH.	CLAY: high plasticity, brown becoming pale grey mottled red brown.	MC>PL	st.		ALLUVIUM
	DS	N = 7 2, 3, 4	1					Vst.	170 210 300 330	
	DS	N = 21 6, 9, 12	2		CL	SILTY CLAY: medium plasticity, grey mottled orange brown. Zones of silty sandy clay.		Vst to H.	450 600 >600 330	
	DS	N = 22 12, 10, 12	3		SM.	CLAYEY SANDY SILT: fine grained, pale grey and yellow brown. Zones of silty sand.	D - M	M.D		
ON RODS	DS	N = 22 9, 9, 13	4		CL-CH.	CLAY: medium to high plasticity, grey mottled orange brown.	MC ≒ PL	Vst - H.	370 450 470 400	
			5							
			6							
			7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 4 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·1m.
Date: 16 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
▼ BEFORE CORING			8		SM.	CLAYEY SILTY SAND: fine grained, pale grey and yellow brown. Zones of sandy clay.	W	L-MD ?		
			9			SHALE: grey, moderately weathered and medium strong with occasional weak bands.	(CLASS 4)			ESTIMATED 'V' BIT REFUSAL. MODERATE TC BIT RESISTANCE WITH LOW BANDS.
			10			REFER TO CORED BOREHOLE LOG.				
			11							
			12							
			13							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 4 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: B471W
Date Drilled: 16 - 10 - 91
Drill Type: G.C.H. RIG.
Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —
R. L. Surface: ≑ 10.1m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific	General
		9		START CORING AT 9.85m.						
FULL RETURN.		10		SHALE: dark grey with pale grey fine grained sandstone laminae.	SW	MS-S			JOINT 80-90° IRREGULAR, SMOOTH, FRAGMENTED.	NB DEFECTS ARE BEDDING PARTINGS 0°-10°, PLANAR, SMOOTH UNLESS LABELLED OTHERWISE.
		11						(CLASS 1)		
		12								
				END OF BOREHOLE AT 12.10m.						
		13								
		14								

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 5 1/2

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·5m.

Date: 14 - 10 - 91 INTERTECH BCD 450 Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION OF AUGERING.						Grass over FILL / TOPSOIL. Silty Clay, low to medium plasticity, brown.	MC < PL			APPEARS MODERATELY COMPACTED.
	DS	N = 7 2,3,4	1		CL-CH.	CLAY : medium to high plasticity, pale grey mottled red brown.	MC > PL	Vst - H.	430 460 600	RESIDUAL
			2			SHALY CLAY: low to medium plasticity, pale grey. Some ironstone bands.	MC < PL	H.		
	DS	N > 15 15, 15/120mm							>600 >600	(CLASS 5)
			3							ESTIMATED 'V' BIT REFUSAL.
	DS		4			SHALE: brown and grey, highly weathered, weak to medium strong with extremely weak bands.	(CLASS 4)			BANDED LOW AND MODERATE 'TC' BIT RESISTANCE.
	DS		5			SHALE : dark grey, slightly weathered and medium strong to strong.	(CLASS 2)			MODERATE RESISTANCE
			6			REFER TO CORED BOREHOLE LOG.				
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 5 2/2

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 14 - 10 - 91
Drill Type: INTERTECH BCD450

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 10.5m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		5		START CORING AT 5.65m.					
FULL RETURN		6		CORE LOSS 0.03m. SHALE: brown and dark grey.	MW	MS			
				as above but with brown ironstained seams.	MW - SW.				
		7		as above but dark grey with pale grey fine grained sandstone laminae.				(CLASS. 1)	JOINT, 60° PLANAR, SMOOTH FRAGMENTED. JOINT, 60° PLANAR, FRAGMENTED. HIGHLY FRAGMENTED SEAM, 10 - 20mm
				END OF BOREHOLE AT 7.65m.					
		8							
		9							
		10							

NB: DEFECTS ARE BEDDING PARTINGS, 0°-10°, PLANAR, SMOOTH UNLESS LABELLED OTHERWISE.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 5A

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W
Date: 16 - 10 - 91
Method: SPIRAL AUGER INTERTECH BCD 450.
R.L. Surface: ≒ 10·8m.
Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION	BS					Grass over FILL: Silty Sandy Clay, low plasticity, brown.	MC < PL			ROOT ZONE 50mm APPEARS MODERATELY COMPACTED.
	BS		1		CL-CH.	CLAY: medium to high plasticity, orange brown. A trace of fine ironstone gravel. Some silty fines.	MC > PL	st / Vst.		
						END OF BOREHOLE AT 1·2m.				
			2							
			3							
			4							
			5							
			6							
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 6 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·8m.

Date: 14 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						Grass over FILL : fine crushed basalt.	D			APPEARS POORLY TO MODERATELY COMPACTED.
						FILL : Silty Clay, low to medium plasticity, brown. Trace of gravel.	MC>PL			
	DS									
	DS	N = 8 4, 4, 4	1		CL-CH	CLAY : medium to high plasticity, grey brown becoming grey mottled brown.	MC > PL	Vst.	520 400	ALLUVIUM.
			2							
	DS	N = 14 3, 6, 8							340 370 550 330	
			3					H.		
	DS	N = 30 7, 15, 15	4						450 430 >600	
			5							
	DS	N > 23 9, 13, 10/100mm	6						320 440 480 500	
			7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 6 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·8m.
Date: 14-10-91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
?			7		CL-CH.	CLAY: medium to high plasticity grey and yellow brown. Zones of silty clay.	MC>PL	VSt H.		
			8							
			9			SHALE: brown and grey, highly weathered and very weak to weak.	(CLASS 4)			LOW 'TC' BIT RESISTANCE WITH MODERATE BANDS.
						REFER TO CORED BOREHOLE LOG.				
			10							
			11							
			12							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 6 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 14 - 10 - 91
Drill Type: G.C.H. RIG.

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 10.8m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		9		START CORING AT 9.3m.					
FULL RETURN.		10		SHALE: brown and dark grey.	HW	W - MS		(CLASS 4)	JOINT 60-90° IRREGULAR FRAGMENTED. CLAY SEAM, 35mm. CLAY SEAM, 20mm. JOINT, 90° PLANAR, SMOOTH.
		11		as above but dark grey with pale grey fine grained sandstone laminae.	MW - SW	MS - S		(CLASS 1)	JOINT, 75° PLANAR, SMOOTH. JOINT, 75-90°, IRREGULAR, SMOOTH. HIGHLY FRAGMENTED SEAM, 5-10mm.
		12		END OF BOREHOLE AT 12.0m.					JOINT, 85°-90°, CURVED SMOOTH
		13							
		14							

NB: DEFECTS ARE BEDDING PARTINGS 0°-10°, PLANAR, SMOOTH, UNLESS LABELLED OTHERWISE.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 7 11.3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≑ 11.0m.

Date: 10 - 10 - 91 INTERTECH BCD 450 Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
MOIST ON BASE BEFORE CORING						BITUMEN : 20mm t. over FINE CRUSHED ROCK : 40mm t. over				PVC CAP.
					CL	FILL : Clayey sand & ripped sandstone.	MC > PL	St.		CONCRETE
					CH.	SILTY CLAY : low to medium plasticity, brown. Grading to.		Vst.		ALLUVIUM
	DS	N = 8 2, 4, 4	1			CLAY : high plasticity, grey brown, becoming pale grey mottled red brown.			270, 300 280, 290	PLUG
			2							50mm DIA PVC STAND-PIPE.
	DS	N = 21 7, 10, 11			CL-CH	CLAY : medium to high plasticity, grey. A trace of medium grained sand, ironstone gravel and fine roots.			400 270 250 300	BACKFILL
			3							
	DS	N = 22 6, 11, 11	4				MC < PL	H.	400 400 450 600	
						as above but with some ironstone gravel bands.				
			5							
	DS	N = 24 7, 10, 14							> 600 > 600 > 600 550	
ON COMPLETION OF SPT TEST.			6							ESTIMATED 'V' BIT REFUSAL.
						INTERBEDDED SHALY CLAY : pale grey and SHALE : brown and grey, highly weathered, weak to medium strong.	(CLASS 4)			LOW TO 'C' BIT RESISTANCE WITH MODERATE BANDS.
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 7 213

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 11.0m

Date: 10 - 10 - 91 INTERTECH BCD 450 Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
▼ BEFORE CORING						SHALE: grey, highly to moderately weathered, medium strong.	(CLASS 4)			LOW RESISTANCE WITH MODERATE BANDS.
						REFER TO CORED BOREHOLE LOG.				BACKFILL
			8							SLOTTED ZONE 1.5m WRAPPED IN GEO-TEXTILE.
			9							
			10							
			11							
			12							
			13							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 7 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 10 - 10 - 91
Drill Type: INTERTECH BCD450

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 11.0m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		7		START CORING AT 7.4m.					
FULL RETURN.				CORE LOSS 0.25m.					
		8		SHALE: brown and grey.	HW — MW	W — MS.	×	(CLASS 4)	CLAY SEAM, 10-15mm.
									2 JOINTS, 25°, PLANAR, ROUGH.
									FRAGMENTED SEAM & CLAY SEAM, 0-12mm.
									CLAY SEAM, 5mm.
									JOINT, 70°, IRREGULAR, ROUGH, CLAYCOATED.
		9					×		HIGHLY FRAGMENTED, 120mm.
									2 JOINTS, 60°, PLANAR, SMOOTH.
									EW/CLAY SEAM, 15mm.
									HIGHLY FRAGMENTED, 40mm.
				— as above but dark grey with very thin fine grained sandstone laminae.	SW	MS — S		(CLASS 1)	
		10					×		
		11		END OF BOREHOLE AT 11.0m.					
		12							

NB: DEFECTS ARE BEDDING PARTINGS 0°-10°, PLANAR SMOOTH UNLESS SHOWN OTHERWISE.

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 8 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·4m.
Date: 14 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						Grass over FILL: Silty Clayey Sand and crushed basalt gravel.	MC>PL			PVC CAP. CONCRETE. APPEARS MODERATELY COMPACTED.
						SILTY CLAY: low to medium plasticity, light brown.				ALLUVIUM.
	DS	N = 9 4, 4, 5	1		CH.	CLAY: high plasticity, grey brown becoming grey mottled red brown.	MC>PL	Vst.	>600	BACKFILL.
	DS	N = 13 5, 6, 7	2						300 340 230 350	50mm DIA. PVC STANDPIPE.
	DS	N = 21 6, 10, 11	3		CL	SILTY CLAY: low to medium plasticity, pale grey mottled yellow brown. Some zones of silty sandy clay and a trace of ironstone gravel.	MC<PL	Vst H.	500 360 450	
	DS	N = 23 7, 10, 13	4						>600 300 450 280	
▼ ON COMPL-TION OF AUG-ERING			5							
			6							
			7		SM.	CLAYEY SANDY SILT: fine grained, pale and yellow brown. Zones of silty sand.	W	L		

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 8 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·4m.

Date: 14 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
	DS				SM	CLAYEY SANDY SILT: as above.	W	L		
						Grading to				
			8			SILTY SANDY CLAY: fine to medium plasticity, pale grey and orange brown. Trace of ironstone gravel.	MC>PL	F-st.		BACKFILL.
	DS									ESTIMATED 'V' BIT REFUSAL
			9			SHALE: grey, highly weathered, weak with very weak and medium strong bands.	(CLASS 4)			LOW 'TC' BIT RESISTANCE WITH SOME MODERATE BANDS.
			10			SHALE: grey, slightly weathered and strong.	(CLASS 1)			
						REFER TO CORED BOREHOLE LOG.				SLOTTED ZONE WRAPPED IN GEOTEXTILE
			11							
			12							
			13							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 8 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 14 - 10 - 91
Drill Type: INTERTECH BCD450

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 10.4m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 150 60 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
				START CORING AT 10.0m.					
FULL RETURN.		10		SHALE: dark grey with very thin fine grained sandstone laminae.	SW	MS S	×	(CLASS 1)	— BEDDING PARTING, 0°-5° IRREGULAR, SMOOTH. — BEDDING PARTING, 3°, PLANAR, SMOOTH. — JOINT, 70°-80°, IRREGULAR, ROUGH. — 4 BEDDING PARTINGS. — JOINT, 75°, IRREGULAR, ROUGH.
		11					×		
		12		END OF BOREHOLE AT 12.0m					
		13							
		14							
		15							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 9 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒10·5m.

Date: 14 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						Grass over FILL: Sandy Silty Clay and crushed gravel.	MC<PL			APPEARS MODERATELY COMPACTED.
	DS					FILL: Clay, medium plasticity, brown and red brown.				
	DS									
	DS	N = 17 7, 9, 8	1		CL	CLAY: medium plasticity, pale grey and grey brown.	MC>PL	H.	500 510 450 510	ALLUVILIM.
						Grading to				
			2		CL-CH	CLAY: medium to high plasticity, grey mottled red brown.				
	DS	N = 18 6, 6, 12							500 510 490	
			3							
					CL	SILTY CLAY: medium plasticity, pale grey and yellow brown		Vst - H.		
	DS	N = 20 6, 8, 12	4						250 300 530	
						as above but with some ironstone gravel band. Occasional band of silty sand.				
			5							
	DS	N = 16 5, 7, 9			CL-CH	CLAY: medium to high plasticity, pale grey and yellow brown. Trace of ironstone gravel.			400 300 290 430	
			6							
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 9 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≑ 10·5m

Date: 14 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
					CL-CH	CLAY: medium to high plasticity, grey, red brown and yellow brown. A trace of ironstone gravel.	MC<PL	V/St H.		
	DS		8							
			9							
BEFORE DRING			10		CL	SILTY CLAY: medium plasticity, pale grey and orange brown.				
			11			SHALE: grey brown and grey, highly to moderately weathered, weak to medium strong.	(CLASS 4)			ESTIMATED 'V' BIT REFUSAL. LOW 'TC' BIT RESISTANCE WITH SOME MODERATE BANDS.
						as above but moderately weathered, medium strong to strong.	(CLASS 2)			
			12			REFER TO CORED BOREHOLE LOG.				
			13							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 9 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 14 - 10 - 91
Drill Type: INTERTECH BCD 450.

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 10.5m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ EW VW W MS S VS ES	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 60 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		11		START CORING AT 11.92m.					
FULL RETURN.		12		SHALE: dark grey with fine grained sandstone laminae.	SW	MS-S	×	(CLASS 1)	HIGHLY FRAGMENTED SEAM, 10-15mm.
		13					×		
		14		END OF BH AT 13.99m					
		15							
		16							

NB. DEFECTS ARE BEDDING PARTINGS, 0°-10°, PLANAR, SMOOTH, UNLESS LABELLED OTHERWISE.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 10 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·8m.

Date: 14 - 10 - 91 INTERTECH BCD 450 Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						Grass over FILL: Silty Clay, low to plasticity, brown. Some concrete pieces and basalt gravel.	MC<PL			APPEARS MODERATELY COMPACTED.
	DS	N = 5 1, 2, 3	1			FILL: Clay, high plasticity, grey brown and red brown. Trace of shale pieces.	MC>PL		170 160 70 100	APPEARS POORLY TO MODERATELY COMPACTED.
					CL	CLAY: medium plasticity, grey mottled red brown. A trace of fine grained sand and pinholes.	MC>PL	st Vst H.		ALLUVIUM.
	DS	N = 17 6, 7, 10	2						320 490 380 450	
ON SPT REFUSAL ON DS AT 4·35m BEFORE CORING.			3		CL	SILTY SANDY CLAY: low to medium plasticity, pale grey and yellow brown. Occasional ironstone gravel bands.		st.		
	DS	N = 12 4, 5, 7	4						170 130 180.	
					CL-CH	CLAY: medium to high plasticity, grey and yellow brown.	MC<PL	Vst.		
	DS	N = 14 5, 6, 8	5						300 270 220 400	
			6			— — — as above but grey and orange brown. Some ironstone gravel.		st to Vst.		
	DS		7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 10 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·8m.

Date: 10 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
					CL-CH.	CLAY: medium to high plasticity, grey and orange brown. Some ironstone gravel.	MC>PL	St - Vst.		
			8			— — — as above but with abundant ironstone gravel.				
	DS		9							
			10							
			11							ESTIMATED 'V' BIT REFUSAL.
						SHALE: grey, moderately weathered, weak to medium strong.	(CLASS 4)			BANDED LOW & MODERATE 'TC' BIT RESISTANCE.
										MODERATE RESISTANCE
			12			REFER TO CORED BOREHOLE LOG.				
			13							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 10 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 10 - 10-91
Drill Type: INTERTECH BCD450

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 10.8m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		11		START CORING AT 11.75m.					
FULL RETURN.		12		SHALE: dark grey. Some fine grained sandstone laminae	SW	MS S	×	(CLASS 1)	NB ALL DEFECTS ARE BEDDING PARTINGS 0°-10°, PLANAR, SMOOTH.
TOTAL LOSS		13					×		
75% RETURN		14		END OF BOREHOLE AT 13.82m.					
		15							
		16							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 11 113

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·5m.

Date: 14 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						Grass over FILL: Clay and crushed shale, ironstone and basalt gravel.				
	DS	N = 14 3, 6, 8	1		CL-CH	CLAY: medium to high plasticity, pale grey mottled orange brown.	MC > PL	Vst to H.	570 540 540	ALLUVIUM.
	DS	N = 27 6, 12, 15	2						> 600 > 600	
	DS	N = 29 7, 19, 10/70mm	3		CL	SANDY SILTY CLAY: medium plasticity, pale grey with yellow-brown and orange brown mottle. zones of sandy clay and clay.		H.	> 600 > 600 > 600	
	DS	N = 26 5, 11, 15	4						590 > 600 550	
			5							
			6					Vst, with hard and stiff bands.		
			7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 11 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·5m.
Date: 14 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
BEFORE CORING	DS	N=12 5, 6, 6	8		CL	SILTY SANDY CLAY: medium plasticity, grey and yellow brown. Abundant zones of clayey silty sand.	MC>PL	Vst with hard and stiff zones.	600 200 550.	
			9							
			10							
			11							
			12							
			13							ESTIMATED 'V' BIT REFUSAL.
						SHALE: grey, highly weathered, very weak with extremely weak and weak bands.	(CLASS 4/5)			LOW 'TC' BIT RESISTANCE.
			14			as above but moderately weathered & medium strong.	(CLASS 3)			MODERATE RESISTANCE.

REFER TO CORED BOREHOLE LOG

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 11 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 14 - 10 - 91
Drill Type: G.C.H. RIG.

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 10.5m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		14		START CORING AT 14.20 m.					
FULL RETURN.		15		SHALE: dark grey with fine grained sandstone laminae.	SW	S	×	CLASS 1)	NB DEFECTS ARE BEDDING PARTINGS 0°-10°, CURVED, SMOOTH.
		16					×		
		17		END OF BOREHOLE AT 16.61m.					
		18							
		19							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 12 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≑ 10·1m.

Date: 11 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						BITUMEN PAVEMENT 55mm thick. FILL: Fine crushed rock 200mm. FILL: Ripped sandstone & clayey sand mixtures, fine to coarse grained.				HAND AUGER APPEARS MODERATELY COMPACTED.
					CH.	CLAY: high plasticity, brown, grey mottled, trace of ironstone gravel.	MC≈PL	V/st to H.		ALLUVIUM.
	DS	N = 21 7, 10, 11	1						280 310 375 400 410	
						becomes red brown and grey mottled.				
			2			as above but some ironstone gravel bands.				
	DS	N = 25 5, 10, 15						H.	310 385 410 440	
			3		CL-CH.	SILTY SANDY CLAY: medium to high plasticity, yellow brown and grey. Grading to.				
	DS	N = 31 7, 13, 18	4		CL	SANDY CLAY: medium plasticity, grey with some ironstone gravel.			430 450 475 480	
			5				MC>PL			
	DS	N = 27 8, 12, 15	6			Grading to.				
					CL-CH.	SILTY SANDY CLAY: medium to high plasticity, yellow brown, some grey mottling.	MC>PL			
	DS		7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 12 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒10·1m.

Date: 11 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						SILTY SANDY CLAY: as above.	MC>PL	H.		
			8		CL	SANDY CLAY: low plasticity yellow brown.	MC>PL			
	DS									← HOLE COLLAPSE ON COMPLETION OF AUGERING.
			9		SC	CLAYEY SAND: fine to medium grained, yellow brown.	W	(MD)		
	DS									
			10							
			11							T 15mm.
	DS					SHALE: dark grey, highly to moderately weathered weak with occasional medium strong bands.	(CLASS 4)			LOW 'TC' BIT RESISTANCE WITH SOME MODERATE BANDS.
			12			as above but moderately weathered medium strong, dark grey.	(CLASS 3)			MODERATE RESIST.
						REFER TO CORED BOREHOLE LOG.				
			13							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 12 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 11 - 10 - 91
Drill Type: G.C.H. RIG.

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 10.1m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific	General
				START CORING AT 12.15m.						
FULL RETURN.		13		SHALE: dark grey.	SW	MS to S	×	(CLASS 1)	— FRAGMENTED ZONE. 0°, 10mm.	NB DEFECTS NOT LABELLED ARE BEDDING PARTINGS AND MECHANICAL BREAKS.
		14					×			
							×			
				END OF BH AT 14.60m						
		15								
		16								
		17								
		18								

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 13 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·3m.

Date: 11 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer kPa.	Remarks
						BITUMEN PAVEMENT 50mm t. FILL: Fine crushed rock 150mm t. FILL: Ripped sandstone and clayey sand mixtures, fine to coarse grained.				APPEARS MODERATELY COMPACTED. HAND AUGER.
	DS	N = 17 6, 6, 11	1		CL-CH	FILL: Sandy Clay, low plasticity, brown with some clay lumps and sandstone gravel.	MC≤PL	Vst to H.	380 395 440 410	ALLUVIUM.
	DS					CLAY: medium to high plasticity, brown, some grey mottling, trace of ironstone gravel.				
			2			as above but red brown and grey mottled.				
	DS	N = 23 7, 10, 13						H.	380 410 440 390.	
			3			Grading to				
	DS	N = 25 12, 11, 14	4		CL-CH	SILTY SANDY CLAY: medium to high plasticity, orange red brown, some ironstone gravel bands.			410 430 500 510	
						as above but some clay lenses of high plasticity, grey.				
	DS		5		CL	SANDY CLAY: medium plasticity, yellow brown and grey with some ironstone gravel.	MC>PL			
	DS	N = 28 11, 13, 15							410 425 400 430	
			6			becomes low to medium plasticity.				
	DS		7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 13 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10.3m.

Date: 11 - 10 - 91 INTERTECH BCD 450 Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
ON COMPLETION					CL	SANDY CLAY: low plasticity, orange brown some iron cemented gravel.	MC>PL	(Vst to H)		
	DS		8							
			9			SHALE: dark grey, moderately weathered, medium strong.	(CLASS 3)			MODERATE 'TC' BIT RESISTANCE.
			10			REFER TO CORED BOREHOLE LOG.				
			11							
			12							
			13							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 13 3/3

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 11 - 10 - 91
Drill Type: INTERTECH BCD450.

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≑ 10.3m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
				START CORING AT 9.7m.					
FULL RETURN.				CORE LOSS 0.1m.					
		10		SHALE : dark grey.	MW	MS S	×		JOINT, VERTICAL, IRREGULAR, ROUGH. FRAGMENTED ZONE 0°, 40mm.
					SW.				= CRUSHED SEAM 0°, 15mm
		11						(CLASS 1/2)	NB. DEFECTS NOT LABELLED ARE BEDDING PARTINGS & MECHANICAL BREAKS.
		12					×		
				END OF BOREHOLE AT 12.28m					
		13							
		14							
		15							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 14 112

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 11·3m
Date: 11 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer kPa.	Remarks
DRY ON COMPLETION OF AUGERING.						Grass over FILL: Clayey Sand, fine to medium grained, brown, some roots.	D			APPEARS POORLY COMPACTED ALLUVIUM. PVC CAP. CEMENT.
					ML		MC>PL	(st)		
	DB				CH	CLAYEY SILT: low plasticity, greyish brown.	MC>PL	Vst.		
	DS	N=7 3,3,4	1			CLAY: high plasticity, red brown, some grey mottling, some ironstone gravel.			210 280 275 260	CLAY BACKFILL
						— — — becomes red brown and grey mottled.				STANDPIPE INSTALLED TO 8·0m.
	DS	N=18 4,7,11	2						245 280 295 345	
			3			— — — becomes grey, trace of sand.				
	DS	N>>6 14, 6/130mm	4			SHALE: grey & dark grey extremely to highly weathered, extremely to very weak, with occasional medium strong bands.	(CLASS 5)			BENTONITE LOW 'TC' BIT RESISTANCE WITH MODERATE BANDS.
	DS	BOUNCING.								
	DS		5			— — — as above but highly weathered, weak.	(CLASS 4)			
	DS					— — — as above but highly weathered, medium strong.	(CLASS 3/4)			SAND
			6			REFER TO CORED BOREHOLE LOG.				2·0m SLOTTED ZONE WRAPPED WITH GEOTEXTILE
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 14 2/2

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471W
Date Drilled: 11 - 10 - 91
Drill Type: INTERTECH BCD 450.

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 11·3m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
				START CORING AT 5·9m.					
				CORE LOSS 0·08m.					
FULL RETURN.		6		SHALE: dark grey, partially ironstained down to 6·7m.	HW	MS	×	(CLASS 4)	— CLAY SEAM, 0° 3mm CLAY SEAM, 0° 3mm EW BAND, 0°, 15mm FRAGMENTED ZONE 0° 20mm.
					MW				— JOINT, 0° PLANAR, ROUGH, FRAGMENTED ABOUT THE JOINT.
		7			SW	MS to S	×	(CLASS 1)	
		8		END OF BOREHOLE AT 8·15m.					
		9							
		10							
		11							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 15 1/2

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≑ 12.0m.

Date: 11 - 10 - 91 G.C.H. RIG. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						Grass over				
DRY ON COMPLETION OF AUGERING.						FILL: Clayey Sand, fine to medium grained, brown with some roots.	D			APPEARS POORLY COMPACTED.
	DS	N = 13 4, 6, 7	1		CH.	CLAY: high plasticity, red brown, with some ironstone gravel.	MC > PL	Vst.	300 320 345 360.	RESIDUAL.
	DS									
	DS		2			SANDSTONE: fine grained, yellow brown, highly weathered very weak to weak.	(CLASS 5)			LOW 'TC' BIT RESISTANCE.
	DS		3			SHALE: grey, extremely weathered extremely weak with some sandstone bands interbedded, some shaly clay bands.				
	DS	N >> 20 20/150mm BOUNCING				as above but highly weathered, medium strong.	(CLASS 4)			MODERATE RESISTANCE.
			4			REFER TO CORED BOREHOLE LOG.				
			5							
			6							
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 15 2/2

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 11 - 10 - 91
Drill Type: G.C.H. RIG.

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 12.0m
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
				START CORING AT 3.7m.					
FULL RETURN.		4		SHALE: brownish grey, some Sandstone bands up to 50mm thick inter-bedded.	HW	MS	×		⇒ CLAY SEAM, 0°, 4mm — CLAY SEAM 0°, 4mm.
				CORE LOSS 0.08m.					
		5		SHALE: as above. — — Sandstone band, 90mm thick. — — — becomes dark grey, partially ironstained.	HW HW to MW MW	MS W to MS. W MS MS	× ×	(CLASS 4) (CLASS 3) (CLASS 1)	⇒ CLAY SEAM 0°, 10mm. CLAY SEAM, 0°, 3mm CLAY SEAM 0°, 20mm. — CLAY SEAM, 0°, 4mm — CLAY SEAM, 0°, 2mm. — EW BAND, 0°, 7mm. — CLAY SEAM, 0°, 3mm.
		6		END OF BOREHOLE AT 6.5m.					
		7							
		8							
		9							

NB. DEFECTS NOT LABELLED ARE BEDDING PARTINGS OR MECHANICAL BREAKS.

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 16 112

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 11·1m.
Date: 15 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION OF AUGERING.	BS					Grass over FILL: Sandy Silty Clay low to medium plasticity, brown. Some brick and concrete fragments.	MC<PL			APPEARS MODERATELY COMPACTED.
	DS	N = 8 4, 3, 5	1		CL.	SILTY CLAY: low plasticity, brown.	MC>PL	VSt	390	RESIDUAL
					CL-CH.	CLAY: medium to high plasticity, orange brown.				ESTIMATED 'V' BIT REFUSAL.
	DS		2			SHALE / CLAYSTONE: pale grey, highly fractured, highly weathered, medium strong. Some extremely weak and ironstone seams.				BANDED LOW AND MODERATE 'TC' BIT RESISTANCE
			3				(CLASS 5)			
	DS		4			SHALE: orange and pale grey, extremely weathered, extremely weak. Some clay, ironstone and weak shale bands.				
AFTER 12 HRS BEFORE CORING.										
						SHALE: brown and grey, moderately weathered, medium strong. Some weak seams.	(CLASS 4/3)			MODERATE RESISTANCE.
			5			REFER TO CORED BOREHOLE LOG.				
			6							
			7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 16 2/2

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 16 - 10 - 91
Drill Type: INTERTECH BCD 450.
Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —
R. L. Surface: ≒ 11.1m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ (EW VW W MS S VS ES)	DEFECT DETAILS: DEFECT SPACING (mm) (600 200 60 20 6 2)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
				START CORING AT 4.95m.					
		5		SHALE: brown and dark grey.	MW	MS	×	(CLASS 3)	— JOINT, 80°, CURVED, SMOOTH. — CLAY SEAM, 5 - 8mm. — HW SEAM, 5 - 10mm.
		6		as above but dark grey with thin fine grained sandstone laminae.	MW/SW	MS/S	× ×	(CLASS 2)	— HIGHLY FRACTURED ZONE, 80mm 3 EW SEAMS, 10mm, 20mm, 10mm — HIGHLY FRACTURED ZONE, 40mm 2 EW SEAM, 10mm, 2mm
		7		END OF BOREHOLE AT 6.9m.					
		8							
		9							
		10							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 17 1/2

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED REDEVELOPMENT

Location: LIVERPOOL HOSPITAL, GOULBURN STREET, LIVERPOOL.

Job No. 8471 W Method: SPIRAL AUGER R.L. Surface: ≒ 10·4m.

Date: 15 - 10 - 91 INTERTECH BCD 450. Datum: A.H.D.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer kPa.	Remarks
DRY ON COMPLETION OF AUGERING.	DS					FILL: Silty Clay, low to medium plasticity, brown, and sand.	MC<PL			APPEARS POORLY TO MODERATELY COMPACTED.
	DS	N = 10 4, 4, 6	1		CH	CLAY: medium to high plasticity, red Brown and pale grey. Trace of ironstone gravel.	MC > PL	Vst H.	440 600 520.	RESIDUAL.
	DS	N > 25 6, 14, 11/50mm	2		CL	SHALY CLAY: low to medium plasticity, pale grey with orange ironstone seams. Occasional extremely weathered shale seam.	MC<PL	H.	>600 >600	
	DS		3			SHALE: grey brown and brown, highly weathered, very weak to weak. Extremely weathered and clay seams.		(CLASS 5)		ESTIMATED 'V' BIT REFUSAL. LOW 'TC' BIT RESISTANCE.
			4			— — — as above but brown and grey, highly weathered, weak to medium strong. Occasional clay seams.		(CLASS 4)		LOW RESISTANCE WITH MODERATE BANDS.
	DS		5			— — — as above but dark grey, slightly weathered, medium strong to strong.		(CLASS 2)		MODERATE TO HIGH RESISTANCE.
			6			REFER TO CORED BOREHOLE LOG.				
			7							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 17 2/2

CORED BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED REDEVELOPMENT
Location: LIVERPOOL HOSPITAL, GOULBURN STREET. LIVERPOOL.

Job No: 8471 W
Date Drilled: 15 - 10 - 91
Drill Type: INTERTECH BCD 450.

Core Size: N.M.L.C.
Inclination: VERTICAL.
Bearing: —

R. L. Surface: ≒ 10·4m.
Datum: A.H.D.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_S(50)$ EW VW W MS S VS ES	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		5		START CORING AT 5·10m.					
		6		SHALE: dark grey with pale grey, fine grained sandstone laminae.	SW	MS S	×	CLASS 1(2)	— JOINT, 45°, PLANAR, SMOOTH. — JOINT, 0°-70°, IRREGULAR, SMOOTH. NB. DEFECTS ARE BEDDING PARTINGS, 0°-10°, PLANAR, SMOOTH UNLESS LABELLED OTHERWISE.
		7		END OF BOREHOLE AT 6·75m.					
		8							
		9							
		10							

CAMPBELL STREET

LES POWELL CENTRE

15 14 13 12 11 10 9 8 7 6 5 5A 4 3 2 1 16 17

DON EVERETT WING

ALEX GRIMSON WING

JAMES McGIRR HOUSE

COLONIAL HALL

GOULBURN STREET

ELIZABETH STREET

MAIN SOUTHERN RAILWAY

N

BOREHOLE LOCATION PLAN

SCALE 0 50m

Jeffery and Katauskas Pty Ltd

Report No. 8471W Figure No. 1

APPENDIX D

Borehole Logs and Borehole Location Plan from Previous Report, Ref: 9014W dated 11 August 1992

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 1

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED BRAIN INJURY UNIT.
Location: LIVERPOOL HOSPITAL, NEAR CAMPBELL STREET, LIVERPOOL.

Job No. 9014 W. Method: SPIRAL AUGER
Date: 30 - 7 - 92 BCD - 450 RIG.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION	DS					FILL: Sandy Clay, low to medium plasticity, brown & dark grey with traces of sandstone gravel.	MC > PL			Grass cover Root zone to 100mm. APPEARS MODERATELY COMPACTED.
	DS	N = 8 2, 3, 5	1		CH.	as above but with zones of dark grey ash. CLAY: high plasticity, pale grey & orange brown mottled.		Vst.	270 330 320.	
	DS	N = 32 7, 13, 19	2		CL-CH.	CLAY: medium to high plasticity, pale grey mottled red brown with zones of ironstone gravel.	MC < PL	H.	> 600 > 600 > 600	ALLUVIAL ORIGIN
	DS	N = 22 9, 11, 11	3		CL.	SANDY CLAY: low to medium plasticity, pale grey with yellow & orange brown mottled zones. Occasional clayey sand zones. Sand fine to medium grained.	MC ≥ PL	Vst		FRIABLE SAMPLE
			4			as above but with silty clay & silty sandy clay bands.	MC < PL	H.		
	DS	N > 31 5, 15, 16/100mm	5						550	FRIABLE
			6			END OF BOREHOLE AT 5.7m.				

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 2

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED BRAIN INJURY UNIT.

Location: LIVERPOOL HOSPITAL, NEAR CAMPBELL STREET, LIVERPOOL.

Job No. 9014 W. Method: SPIRAL AUGER

Date: 30 - 7 - 92 BCD - 450 RIG.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer kPa. Readings	Remarks
DRY ON COMPLETION						FILL: Sandy Clay, low plasticity, brown with traces of roadbase gravel & ash.	MC < PL			Grass cover Root zone to 100mm
	DS	N = 16 6, 8, 8				FILL: Clay, medium to high plasticity, brown & dark grey with zones of ash gravel.			400 280	APPEARS WELL COMPACTED.
			1		CH.	CLAY: high plasticity, pale grey & orange brown.	MC > PL	Vst to H.		
	U50					as above but pale grey & red brown mottled.			470 510.	
		N = 24	2							ALLUVIAL ORIGIN.
	DS	5, 10, 14			CL-CH	CLAY: medium to high plasticity, pale grey mottled orange & red brown with some sand. Trace of ironstone gravel.		H.	>600 >600.	
			3		CL	SANDY CLAY: low to medium plasticity, pale grey & yellow brown with zones of clayey sand.				
	DS	N = 32 6, 13, 19				as above but pale grey and red brown with bands of sand.				FRIABLE
			4							
					CL/SC	SANDY CLAY/CLAYEY SAND fine to medium grained, low plasticity, pale grey & red brown.	D to M.	MD		
	DS	N = 26 8, 12, 14	5							FRIABLE
						END OF BOREHOLE AT 5.45m.				
			6							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED BRAIN INJURY UNIT.

Location: LIVERPOOL HOSPITAL, NEAR CAMPBELL STREET, LIVERPOOL.

Job No. 9014 W. Method: SPIRAL AUGER

Date: 30 - 7 - 92 BCD - 450 RIG.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer kPa.	Remarks
DRY ON COMPLETION.	DS	N = 23 8, 11, 12	1			FILL: Sandy clay, low plasticity, brown with clayey zones, trace of gravel.	MC < PL.			Grass cover Root zone to 50mm. APPEARS MODERATELY TO WELL COMPACTED.
					CL-CH.	SILTY CLAY: medium to high plasticity, pale grey mottled orange & red brown.		H.	> 600.	
			2			— — — as above but with a trace of sand.				ALLUVIAL ORIGIN.
	DS	N = 24 5, 10, 14							> 600 > 600 > 600.	
			3		CL.	SANDY CLAY: low to medium plasticity, pale grey with yellow brown mottled zones. Clayey Sand zones. Sand fine to medium grained.	MC ≤ PL			
	DS	N = 35 13, 18, 17	4							FRIABLE
						Grading to				
	DS		5		SC	CLAYEY SAND: fine to medium grained, pale grey & yellow brown with zones of sandy clay and sand.	D to M.	D		
	DS	N = 33 10, 13, 20								FRIABLE
			6			END OF BOREHOLE AT 5.75m.				

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 4

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

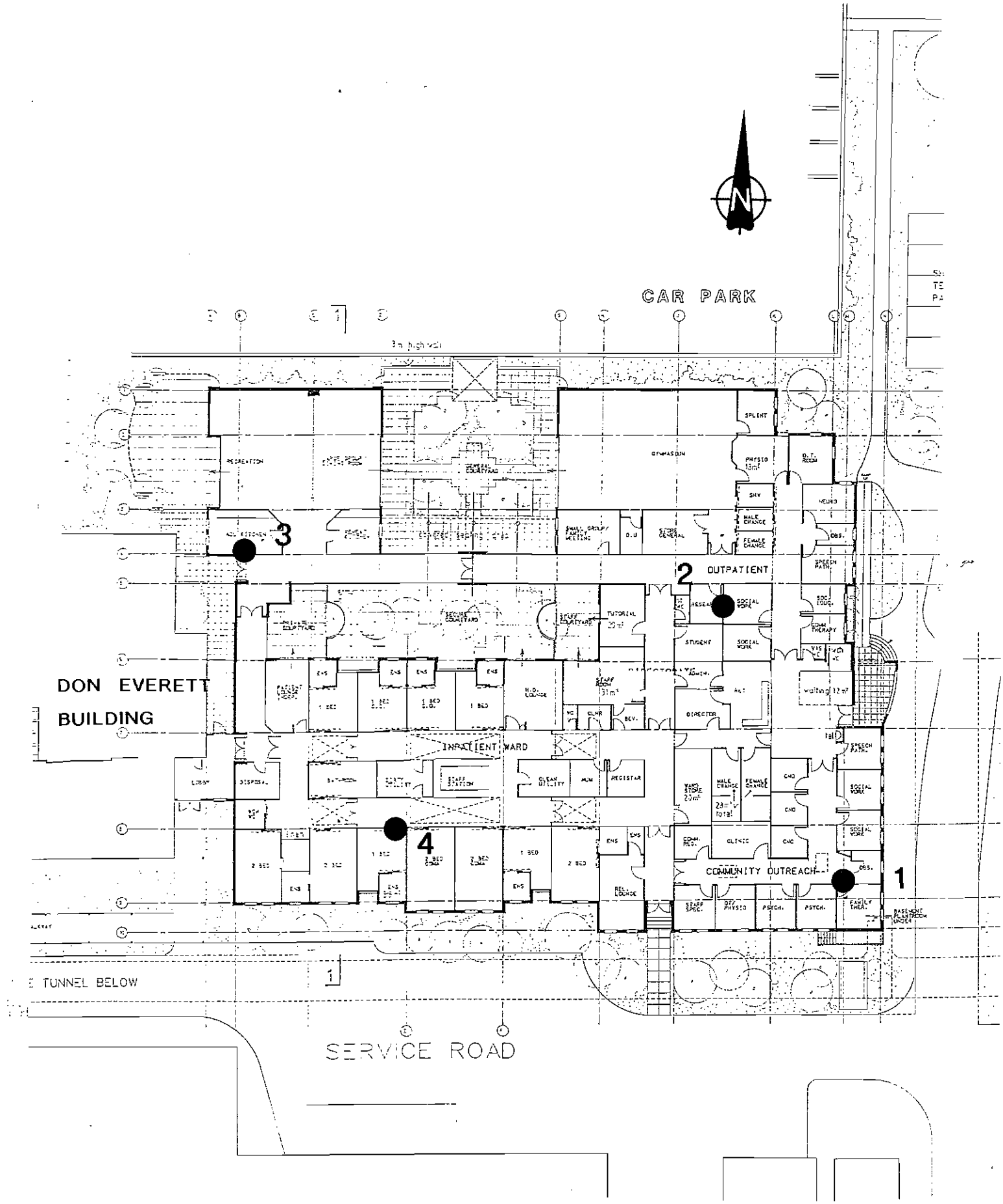
Project: PROPOSED BRAIN INJURY UNIT.

Location: LIVERPOOL HOSPITAL, NEAR CAMPBELL STREET, LIVERPOOL.

Job No. 9014 W. Method: SPIRAL AUGER

Date: 30 - 7 - 92 BCD - 450 RIG.

Groundwater Record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
DRY ON COMPLETION	DS	N = 18 10, 8, 10	1			FILL: Sandy Clay/Clayey Sand, fine to medium grained, low plasticity brown with traces of sandstone gravel & glass.	D.			Grass cover Root zone to 50mm. APPEARS WELL COMPACTED.
	DS		2		CH	CLAY: high plasticity, pale grey & orange brown mottled.	MC<PL	H.	>600.	U50 ATTEMPTED COULD ONLY PUSH 50mm.
	DS	N > 30 8, 16, 14/70mm	3		CL	SILTY CLAY: medium plasticity, pale grey mottled red & yellow brown with zones of ironstone. Trace of sand.			>600 >600	ALLUVIAL ORIGIN.
	DS	N > 15 21, 15 /70mm	4		CL.	SILTY SANDY CLAY: low plasticity, pale grey mottled orange & red brown. — as above but with bands of sand.				U50 ATTEMPTED COULD NOT PENETRATE MORE THAN 30mm FRIABLE
	DS	N = 30 13, 14, 16	5		CL/SC.	SANDY CLAY/CLAYEY SAND. fine to medium grained, low plasticity, pale grey with red brown zones, some silty fines.	D - M	D		
					CL	SANDY SILTY CLAY: low to medium plasticity, pale grey with red brown mottling.	MC<PL	H.	>600.	FRIABLE
			6			END OF BOREHOLE AT 5.75m.				



BOREHOLE LOCATION PLAN

SCALE

0 20m

Jeffery and Katauskas Pty Ltd

Report No. 9014W Figure No. 1

APPENDIX E

Borehole Logs and Borehole Location Plan from Previous Report, Ref: 9597WD dated 30 June 1993

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 1/1/4

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.

Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10·4m

Date: 13 - 5 - 93 BCD 450. Datum: AHD

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer kPa.	Remarks
						FILL: Topsoil, silty clay.	M fb.			
						FILL: Ash, silt, sand fine gravel sizes.	M.			APPEARS POORLY TO MODERATELY COMPACTED.
						FILL: Topsoil & silty clay, yellow brown mixture.	M.			
	DS	N = 10 4, 4, 6	1		CH.	SILTY CLAY: high plasticity, yellow brown, some fine sand.	MC≤PL	H.	>600 >600 >600.	
	DS	N = 19 6, 8, 11	2		CH.	SILTY CLAY: high plasticity, grey with red brown mottling.	MC>PL	Vst to H.	400 510 550.	
	DS	N = 23 8, 11, 12	3							
			4						440 430 330.	
			5			as above but with some iron cemented gravel to approx 6·0m.				
						Grading to.				
	DS	N = 21 6, 11, 10	6		CL.	SILTY SANDY CLAY: low to medium plasticity, grey, sand is very fine grained.			600 500 600.	
			7		SP.	SAND: as below	M	MD.		

LOGGED BY: MD CHECKED BY:

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 1/2/4

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10.4m
Date: 13 - 5 - 93 BCD 450. Datum: AHD

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
					SP.	SAND: fine to medium grained, red brown, some silt fines.	M	MD.		
	DS		8							
			9							
	DS	N = 28 8, 14, 14								
AFTER 3¾ HRS.			10		SM.	SILTY SAND: fine to medium grained, red brown.				
RS.			11				W.			
			12		SP	SAND: fine to medium grained with some silty fines red brown with some grey lenses				
	DS	N = 20 7, 8, 12								
			13			(Continuous augering to 22.75m without withdrawl.)				30mm
			14							50mm.

LOGGED BY: MD CHECKED BY:

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. / 3/4

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≒ 10·4m
Date: 13 - 5 - 93 BCD 450. Datum: AHD.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
			15		SP	SAND: as above but with some clayey bands based upon returned cuttings				100mm
										100mm
			16							
			17							15mm
			18							30mm
			19							
			20			SHALE: highly weathered, extremely weak to very weak.				15mm.
			21							

LOGGED BY: MD CHECKED BY:

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 1 4/4.

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≈10.4m
Date: 13 - 5 - 93 BCD 450. Datum: AHD.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
			22			SHALE: as above ——— as above but moderately weathered, weak.				⊤ 30mm HARDER GRAVELS OR VERY WEAK ROCK.
	DS.									
			23			END OF BOREHOLE AT 22.95m.				
			24							
			25							
			26							
			27							
			28							

LOGGED BY: MD CHECKED BY:

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 2 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10.2m
Date: 13 - 5 - 93 BCD 450. Datum: AHD

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						FILL: Topsoil.				APPEARS MODERATELY COMPACTED.
						FILL: Silty Clay	M-D fb			
					CH.	SILTY CLAY: medium to high plasticity, yellow brown.	MC<PL	H.		
	DS	N = 18 6, 7, 11	1						>600 >600 >600.	
						as above but red brown.				
			2		CL.	SANDY SILTY CLAY: low plasticity, grey with red & yellow brown mottling.				
					CH.	SILTY CLAY: high plasticity grey with red brown mottling.	MC>PL			
	DS	N >> 12 6, 12, -	3						>600 >600 >600.	
			4			Grading to				
					CL	SANDY CLAY: low to medium plasticity grey with yellow & red brown mottling.	MC<PL	(Vst to H)		
			5							
						as above but with some gravel between 5.8m and 6.5m.				
			6							
			7							

LOGGED BY: MD CHECKED BY:

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 2 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10.2m
Date: 13 - 5 - 93 BCD 450. Datum: AHD

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
			7		SP.	SAND: fine to medium grained, some silt fines of low plasticity, light yellow brown with some red brown & light grey band. Some silty sand lenses.	M	D		
	DS	N >20 12, 20, HAMMER BOUNCING	8							
			9							T 10mm.
						Grading to.				
					SM	SILTY SAND: fine to medium grained, brown with some Sandy Clay bands and some clayey sand bands of low plasticity.		(D)		
▼ CAVE IN TO 10.85m ON COMPLETION. WL @ 10.8 AFTER 23 HOURS			10							T 40mm
							W.			
			11							
			12							T 40mm.
		Nc 9 8 7 30/140mm HAMMER BOUNCING	13					MD D		— WITHDRAW AUGER T 10mm.
			14							

LOGGED BY: MD CHECKED BY: MJA

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 2 3/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10·2 m
Date: 13 - 5 - 93 BCD 450. Datum: AHD.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
					SM.	SILTY SAND: as above (Continuous augering to 19·1m without withdrawl.)		(D)		
			15							3mm
			16							
			17							15mm
			18							
	DS					CLAYEY SAND on auger flights, fine to medium grained clay fines of low plasticity.				
		Nc. 7 18 16 20/80mm	19							AUGER WITHDRAWL.
						END OF BOREHOLE AT 19·63				
			20							
			21							

LOGGED BY: MD CHECKED BY:

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 3 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10.3m
Date: 14 - 5 - 93 BCD 450. Datum: AHD

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						FILL: Topsoil, Silty clay, yellow brown.	MC<PL	H.		APPEARS MODERATELY TO WELL COMPACTED
	DS	N = 24 13, 11, 13				FILL: Silty Clay, low to medium plasticity, yellow brown.				
					CL-CH.		MC<PL	H.		
			1			SILTY CLAY: medium to high plasticity, yellow brown.				
					CL.		MC<PL	(H)		
						SANDY SILTY CLAY: low to medium plasticity, grey with red brown & yellow mottling.				
			2							
	DS	N = 15 4, 5, 10							>600 >600 >600	
			3		CL-CH.	SILTY CLAY: medium to high plasticity, grey with red brown mottling with some sandy clay zones.	MC>PL			
			4							
			5							
						— — — — as above				
					CL.	but low plasticity	MC<PL			
			6							
	DS	N >> 18 14, 18, -							>600 >600 >600.	
			7							

LOGGED BY: MD CHECKED BY:

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 3 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10.3m
Date: 14 - 5 - 93 BCD 450. Datum: AHD

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
					SM.	SILTY SAND: fine to medium grained, brown & red brown banded. Some Sandy Clay bands.	M	D.		CAVE IN AT 7.65m ON COMPLETION.
WHILST DRILLING.			8							
			9							
						as above but with some fine gravel to 12mm ø 9m to 10m	W.			
			10							
	DS	N > 30 8, 18, 12/80mm								15mm
		HAMMER BOUNCING	11			(Continuous augering without withdrawl to 16.8m)				
			12							5mm
			13							
								MD.		
			14							100mm

LOGGED BY: MD CHECKED BY: MJ

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 3 3/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.

Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10.3m

Date: 14 - 5 - 93 BCD 450. Datum: AHD.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
			14		SM.	SILTY SAND: as above.	W	(D)		
			15							T 10mm.
			16			Sample on auger flights - Silty sand; fine to medium grained, dark grey with some sandy clay lenses.				
		Nc 28						VD.		
			17			Continuous augering without withdrawl to 20.25m				
			18							
			19							
			20			Sample on auger flights. SAND: fine to medium grained, grey with some silt fines and clayey bands.				
						END OF BOREHOLE AT 20.25				
			21							

LOGGED BY: MD CHECKED BY: MR

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 4 1/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.

Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≈ 10.3m

Date: 14 - 5 - 93 BCD 450. Datum: AHD

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
						FILL: Topsoil, silty clay, brown	M.			APPEARS POORLY COMPACTED.
						FILL: Ash, silt, sand & gravel sizes.	M-D			
						FILL: Alternate bands of silty clay, medium to high plasticity, yellow brown and silty sand, grey brown.	M.			
	DS	N = 3 2, 2, 1	1							
					CL.	SILTY CLAY: medium plasticity, yellow brown.	MC > PL	(Vst)		
			2		CL.	SANDY SILTY CLAY: low plasticity, grey with yellow & red brown mottling.	MC ≈ PL	(Vst)		
	DS	N = 15 4, 6, 9			CL-CH	SILTY CLAY: medium to high plasticity, grey with red brown mottling.	MC > PL	Vst.	300 400 350.	
			3							
			4							
						Grading to				
					CL.	SANDY SILTY CLAY: low plasticity, grey with yellow & red brown mottling. Sand is fine grained.	MC < PL.	H.		
			5							
	DS	N = 23 9, 11, 21							>600 >600 >600.	
			6							
					SM.	SILTY SAND: fine to medium grained, yellow & red brown.				
			7							

LOGGED BY: MD. CHECKED BY: MJA

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 4 2/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.

Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10.3m

Date: 14 - 5 - 93 BCD 450. Datum: AHD

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
					SM	SILTY SAND: as above but with some fine grained to approx 7.5m.		D.		
			8			Sandy Clay band at approx. 7.5m.				
	DS	N >> 15 11, 15/75mm HAMMER BOUNCING								
			9							<5mm
ON COMPLETION										CAVE IN AND WATER LEVEL AT 9.65m.
			10		SP.	SAND: with some silty fines. Some clayey bands.				
			11							10mm
			12							15mm
			13			as above but with some gravel approx 13.0m - 13.5m				
					CL.	SILTY CLAY: high plasticity, grey & brown	MC>PL	Vst	370,370 280.	
	DS	N = 18								

LOGGED BY: MD CHECKED BY: MJA

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 4 3/3

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface: ≑ 10-3m
Date: 14 - 5 - 93 BCD 450. Datum: AHD.

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
	DS	5, 9, 9	15			(Continuous augering without withdrawl to 19·8m. SILTY SAND: with sandy clay bands. Sand, is fine to medium grained grey & brown dense. Clay, high plasticity, very stiff. based upon returns cuttings.	W.	MD.		⊤ 15mm.
			16							⊤ 5mm
			17							
			18							⊤ 40mm
			19			— — — as above but with some gravel.				⊤ 30mm.
			20			END OF BOREHOLE AT 19·8m.				
			21							

LOGGED BY: MD CHECKED BY: MD

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. P1

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE
Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface:
Date: 13 - 5 - 93 BCD 450. Datum:

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
Y ON COMPLETION						FILL: Topsoil.				
						FILL: Silty clay.				
	BS	N = 24 14, 11, 13	1			FILL: Silty clay high plasticity, yellow brown.	MC < PL	(Vst to H)		NO RECOVERY IN SPT SPLIT SPOON. APPEARS WELL COMPACTED
						——— as above but with some fine sand, red brown.				
						END OF BOREHOLE AT 1.5m.				
			2							
			3							
			4							
			5							
			6							
			7							

LOGGED BY: MD CHECKED BY:

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. P2

BOREHOLE LOG

Client: SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

Project: PROPOSED AREA COMPUTING AND INFORMATION SERVICES CENTRE.

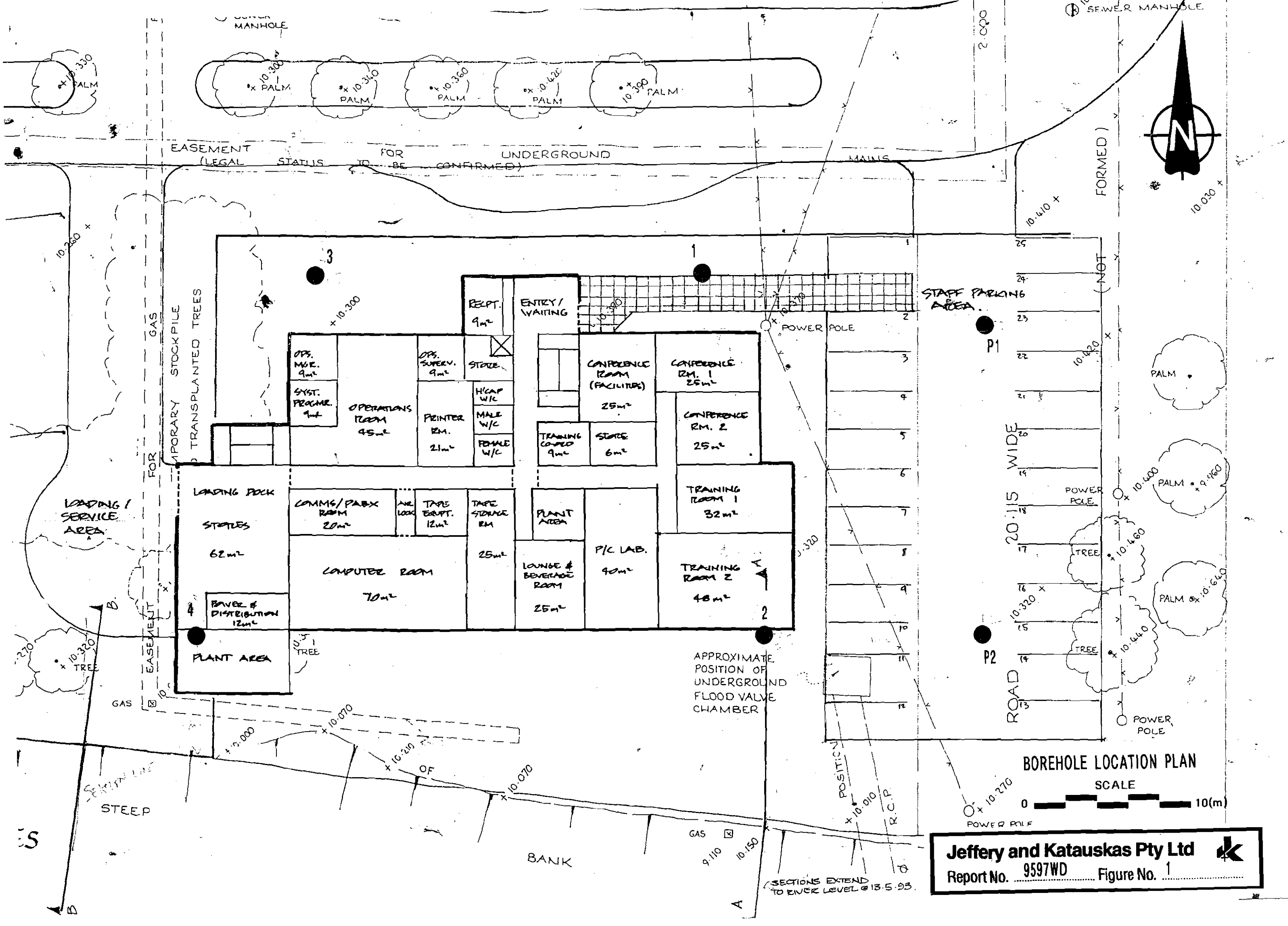
Location: EASTERN CAMPUS - LIVERPOOL HOSPITAL.

Job No. 9597 WD. Method: SPIRAL AUGER R.L. Surface:

Date: 13 - 5 - 93 BCD 450. Datum:

Groundwater record	Samples	Field Tests	Depth (m.)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings kPa.	Remarks
Y ON COMPLETION	DS	N = 29 13, 11, 18	1			TOPSOIL: Silty Clay brown.	M.			
						FILL: Silty clay, medium plasticity, yellow brown.	M-D (fb)			APPEARS WELL COMPACTED.
					CL.	SILTY SANDY CLAY: low plasticity, mottled grey, red brown & yellow brown.	MC<PL	(Vst to H)		
						END OF BOREHOLE AT 1.5m.				
			2							
			3							
			4							
			5							
			6							
			7							

LOGGED BY: MD CHECKED BY:



BOREHOLE LOCATION PLAN

SCALE 0 — 10(m)

Jeffery and Katauskas Pty Ltd

Report No. 9597WD Figure No. 1

APPENDIX F

Borehole Logs and Borehole Location Plan from Previous Reports,

- **Ref: M17359WA dated 3 September 2003**
- **Ref: M17359WA2 dated 10 December 2003**
- **Ref: M17359WA4 dated 16 July 2004**

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101 1/4

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≅ 10.1m

Date: 19-12-02 **Datum:** AHD

Logged/Checked by: A.J./AGH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty sand, fine to medium grained, dark brown, with clay nodules, with a trace of fine to coarse grained sandstone and igneous gravel.	M			
					N = 9 3,4,5				FILL: Silty clay, low plasticity, brown and various colours, with fine to medium grained sand, a trace of fine to medium grained igneous gravel, with occasional high plasticity seams.	MC > PL		290 330	APPEARS POORLY TO MODERATELY COMPACTED
					N = 5 3,2,3	1						150 100 140	POSSIBLY BACKFILL TO ADJACENT SERVICES TUNNEL
						2							
					N = 28 6,12,16	3		CH	SILTY CLAY: high plasticity, brown, with a trace of ironstone gravel.	MC > PL	VSt-H	- 420 380 540	ALLUVIAL
								CL	SILTY CLAY: low to medium plasticity, grey mottled orange brown, with fine grained sand.				
						4		SC	CLAYEY SAND: fine to medium grained, orange brown.	M	(MD)		
					N = 29 7,14,15			CH	SILTY CLAY: high plasticity, orange brown mottled grey, with ironstone gravel.	MC≅PL	H	> 600 590 > 600	
						5							
					N = 27 7,12,15	6			as above, but mottled grey and orange brown, with fine grained sand.			> 600 470 > 600	
ON 20-12-02 ▼						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101 2/4

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≅ 10.1m

Date: 19-12-02 **Datum:** AHD

Logged/Checked by: A.J./ AJH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								CL	SILTY CLAY: medium plasticity, grey mottled orange brown, with occasional sand seams.	MC>PL	S-F		
					N = 9 3,3,6						St-VSt	30 30 70 190 220	
▶						8							
								CL	SILTY SANDY CLAY: low plasticity, grey mottled orange brown, with dark brown clayey sand bands.		F-St		
					N = 12 3,6,6	9						70 70 100 150	SPT SUNK FROM 9.0m TO 9.2m UNDER SELF WEIGHT
						10		SC	SILTY CLAYEY SAND: fine to coarse grained, black.	W	MD		
					N = 38 2,10,28			SP	SAND: fine to coarse grained, grey, with a trace of fine grained rounded quartz gravel.		D		
						11							
						12							
						13		-	SHALE: dark grey, with extremely weathered seams.	SW	H	-	LOW 'TC' BIT RESISTANCE
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101 3/4

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≅ 10.1m

Date: 19-12-02 **Datum:** AHD

Logged/Checked by: A.J./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
									SHALE: dark grey, with extremely weathered seams.	SW	H		
									REFER TO CORED BOREHOLE LOG				
						15							
						16							
						17							
						18							
						19							
						20							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101 4/4

CORED BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Core Size:** NMLC **R.L. Surface:** ≅ 10.1m

Date: 19-12-02 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK350 **Bearing:** - **Logged/Checked by:** A.J./ASH

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 600 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		14		START CORING AT 14.33m					
				SHALE: dark grey, with light grey, fine grained sandstone laminae, bedded at 0-5°.	SW-Fr	H	×		- XWS, 7mm.t - XWS, 7mm.t - Cr, 5mm.t
		15		CORE LOSS 20mm.t SHALE: dark grey, with light grey, fine grained sandstone laminae, bedded at 0-5°.	SW-Fr	H	×		- CS, 10mm.t - XWS, 10mm.t - Cr, 5mm.t - CS, 1mm.t
		16					×		
							×		
		17					×		50mm DIAMETER SLOTTED PVC STANDPIPE INSTALLED TO 12.0m DEPTH
				END OF BOREHOLE AT 17.29m					
		18							
		19							
		20							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 102 1/4

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≅ 9.6m

Date: 19-12-02 **Datum:** AHD

Logged/Checked by: A.J./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			CONCRETE: 165mm.t				7mm DIAMETER REINFORCEMENT AT 75mm TOP COVER. 9mm DIAMETER REINFORCEMENT AT 85mm TOP COVER.
					N = 6 1,2,4			-	FILL: Silty sand, fine to coarse grained, dark grey, with clay fines with a trace of fine to coarse grained sub rounded river gravel and angular igneous gravel.	M MC>PL	-	- 100 170 250	
						1		CH	FILL: Silty clay, high plasticity, dark grey and various colours, with a trace of fine to medium grained igneous gravel and rootlets.	MC>PL	VSt	-	APPEARS POORLY TO MODERATELY COMPACTED
					N = 17 4,8,9				SILTY CLAY: high plasticity, grey mottled red brown, with a trace of rootlets.			320 290 350	ALLUVIAL
						2							
					N = 28 10,13,15	3					H	570 >600 >600	
						4		CL-CH	SILTY CLAY: medium to high plasticity, grey mottled orange and red brown, with a trace of ironstone gravel.				
					N = 25 8,10,15	5						300 >600 440	
▼ ON 20-12-02								SP	SAND: fine to medium grained, orange brown, with occasional silty sand seams.	M	(MD)		
					N = 31 10,14,17	6			as above, but light grey.		D		
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 102 2/4

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≅ 9.6m

Date: 19-12-02 **Datum:** AHD

Logged/Checked by: A.J./JSH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
▶						8		SP	SAND: fine to coarse grained, dark grey brown, with silt fines.	M	D		
										W			
					N = 32 9,14,18	9							
						10							
									as above, but with a trace of fine to medium grained sub rounded river gravel, with occasional clay bands.				
						11							
					SPT 15/50mm REFUSAL	12			SHALE: dark grey, with clay seams.	XW-DW	EL-VL		VERY LOW 'TC' BIT RESISTANCE
						13							
									SHALE: dark grey, with extremely weathered seams.	SW-Fr	H		LOW RESISTANCE
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 102 3/4

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≅ 9.6m

Date: 19-12-02 **Datum:** AHD

Logged/Checked by: A.J./ASH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
									SHALE: dark grey, with extremely weathered seams	SW-Fr	H		
									REFER TO CORED BOREHOLE LOG				
						15							
						16							
						17							
						18							
						19							
						20							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No. 102 4/4

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Core Size:** NMLC **R.L. Surface:** ≅ 9.6m

Date: 19-12-02 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK350 **Bearing:** - **Logged/Checked by:** A.J./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		14		START CORING AT 14.28m					
		15		SHALE: dark grey, with light grey, fine grained sandstone laminae, bedded at 0-5°.	SW-Fr	H			
		16							- CS, 1mm.t
		17							- CS, 1mm.t - CS, 18mm.t 50mm DIAMETER SLOTTED PVC STANDPIPE INSTALLED TO 12.0m DEPTH
				END OF BOREHOLE AT 17.27m					
		18							
		19							
		20							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 103 1/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK550 **R.L. Surface:** ≅ 10.1m

Date: 20-12-02 **Datum:** AHD

Logged/Checked by: A.J.H./AJ

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0		-	ASPHALTIC CONCRETE: 70mm.t over ROADBASE: 50mm.t	MC>PL			
								CH	FILL; Silty clay, medium to high plasticity, brown, with a trace of fine grained sub angular igneous gravel.	MC>PL	St	-	ALLUVIAL
					N = 6 1,2,4							150 140 180	
						1			SILTY CLAY: high plasticity, light brown mottled light grey, with a trace of rootlets		VSt		
									as above, but brown mottled red brown and light grey, with a trace of fine grained ironstone gravel.				
					N = 11 2,5,6							200 240 220	
						2			SILTY CLAY: high plasticity, light grey mottled red brown, with a trace of rootlets.				
						3		CL	SILTY SANDY CLAY: medium plasticity, light grey mottled red brown, fine grained sand.	MC>PL	H	550 520 550 >600 >600 >600	
					N = 29 6,12,17			CL	SANDY CLAY: low to medium plasticity, light grey, fine to medium grained sand, with clayey sand seams.				
						4		SP	SAND: fine to coarse grained, light yellow brown, with a trace of silt fines.	M	MD		
					N = 20 6,9,11,								
▼ ON COMPLETION OF CORING AFTER REMOVAL OF CASING						5							
									SAND: medium to coarse grained, orange brown.				
					N = 23 7,12,11	6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 103 2/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK550 **R.L. Surface:** ≅ 10.1m

Date: 20-12-02 **Datum:** AHD

Logged/Checked by: A.J.H./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SP	SAND: fine to coarse grained, brown, with clay fines and a trace of silt fines, with occasional clayey sand seams.	M	MD		ALLUVIAL
					N = 32 7,14,18				as above, but with a trace of fine to medium grained sub rounded quartz gravel.		D		
						8							
▶								SM	SILTY SAND: fine to medium grained, dark brown, with a trace of clay fines.	W			
					N = 43 13,21,22	9			as above, but with sand and clayey sand seams, with a trace of fine to medium grained river gravel.				
						10							
								-	SHALE: dark grey, with medium strength bands.	DW	VL	-	VERY LOW 'TC' BIT RESISTANCE
						11			SHALE: dark grey.	SW-Fr	H		HIGH RESISTANCE
									REFER TO CORED BOREHOLE LOG				
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No. 103 3/3

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Core Size:** NMLC **R.L. Surface:** ≅ 10.1m

Date: 20-12-02 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK550 **Bearing:** - **Logged/Checked by:** A.J.H./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		10							
				START CORING AT 11.00m					
FULL RETURN		11		SHALE: dark grey, with light grey fine grained sandstone laminae, bedded at 0-5°.	SW-Fr	H	×		- Cr, 12mm.t - Cr, 10mm.t
		12					×		- Cr, 11mm.t - Cr, 18mm.t
							×		- Cr, 50mm.t
		13				M-H	×		
							×		
				END OF BOREHOLE AT 13.51m					
		14							
		15							
		16							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 104 1/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≅ 10.0m

Date: 20-12-02 **Datum:** AHD

Logged/Checked by: A.H./AJ

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			ASPHALTIC CONCRETE: 70mm.t				
									FILL: Gravelly sand, fine to medium grained, grey, fine to coarse grained angular igneous gravel (roadbase).	M			
					N = 7 3,4,3				FILL: Silty clay, medium to high plasticity, mottled brown grey and orange brown, with fine to coarse grained sub angular sandstone gravel.	MC>PL			APPEARS MODERATELY COMPACTED
						1		CL-CH	SILTY CLAY: medium to high plasticity, grey mottled red and orange.	MC>PL	H	-	ALLUVIAL
					N = 11 4,4,7							500 450 480	
						2			as above, but grey mottled red brown.				
					N = 33 10,16,17	3						>600 >600 >600	
▼ ON COMPLETION OF CORING AND AFTER REMOVAL OF CASING						4			SILTY CLAY: medium to high plasticity, grey mottled red and orange, with a trace of fine to coarse grained ironstone gravel, and occasional fine grained sand bands.				
					N = 16 8,7,9							>600 550	
						5						400	
					N = 19 7,11,8	6						450 400 420	
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 104 2/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≅ 10.0m

Date: 20-12-02 **Datum:** AHD

Logged/Checked by: A.H./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								CL-CH	SILTY CLAY: medium to high plasticity, grey mottled red and orange, with a trace of fine to coarse grained ironstone gravel.	MC>PL	H		
					N = 13 6,6,7	8		SM	SILTY SAND: fine to medium grained, grey, with orange brown and red brown clay bands.	M	MD		
▶										W			
					N = 36 5,13,20	9			SILTY SAND: fine to medium grained, grey brown.		D		
						10							
					N > 40 27,40/ 50mm REFUSAL	11		-	SHALE: dark grey.	XW-DW	EL-VL		VERY LOW 'TC' BIT RESISTANCE
						12							
						13				SW-Fr	M-H		LOW RESISTANCE
						14			REFER TO CORED BOREHOLE LOG				

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **104** 3/3

CORED BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH FACILITY

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359SA **Core Size:** NMLC **R.L. Surface:** ≅ 10.0m

Date: 20-12-02 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK350 **Bearing:** - **Logged/Checked by:** A.H./ A.J

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		13		START CORING AT 13.60m					
FULL RET URN		14		SHALE: dark grey, with light grey, fine grained sandstone laminae, bedded at 0-5°.	SW-Fr	M-H	×		
						H	×		
		15					×		
							×		- J, 65°, Un, R - J, 65°, Un, R
		16					×		
				as above, but with a trace of fine grained angular quartz gravel.			×		- J, 10°, Un, R - J, 25°, Un, R
				END OF BOREHOLE AT 16.65m					
		17							
		18							
		19							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 105 1/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA2 **Method:** SPIRAL AUGER JK450 **R.L. Surface:** 9.95m

Date: 30-10-03 **Datum:** AHD

Logged/Checked by: A.J.H./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty clay, medium plasticity, dark brown, with a trace of brick and concrete fragments.	MC>PL			
								CH		MC>PL	St-VSt	-	ALLUVIAL
					N = 5 3,3,2				SILTY CLAY: high plasticity, brown and light brown mottled grey brown.			180 240 220	SLIGHT HYDROCARBON ODOUR TO 1.0m DEPTH
						1							
						2		CL	SITLY CLAY: medium plasticity, light brown and light grey, with a trace of fine grained sand.	MC≅PL	H		
					N = 24 8,12,12	3		CL	SILTY SANDY CLAY: medium plasticity, light grey mottled light orange brown, fine to medium grained sand.			550 580 >600	
ON COMPLETION OF CORING						4							
						5		SP	SAND; fine to medium grained, orange brown, with light brown bands.	M	(MD)		
						6							
						7			as above, but orange brown and grey brown, with clay fines.				

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 105 2/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA2 **Method:** SPIRAL AUGER JK450 **R.L. Surface:** 9.95m

Date: 30-10-03 **Datum:** AHD

Logged/Checked by: A.J.H./A.J.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
					N = 39 13,17,22	8		SP	SAND: fine to coarse grained, orange brown and grey brown, with clay fines and occasional clayey sand bands.	W	D		
						9			as above, but brown, with a trace of clay fines.				
								-	SHALE: dark grey, with fine grained sandstone laminae.	SW-Fr	M-H	-	LOW TO MODERATE 'TC' BIT RESISTANCE
						10			REFER TO CORED BOREHOLE LOG				
						11							
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 105 3/3

CORED BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA2 **Core Size:** NMLC **R.L. Surface:** 9.95m

Date: 30-10-03 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK450 **Bearing:** - **Logged/Checked by:** A.J.H./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		9		START CORING AT 9.80m					
FULL RETURN		10		SHALE: dark grey, with fine grained sandstone laminae, bedded at 0-5°, spacing 5-20mm.	SW-Fr	M-H	×		- CS, 0°, 3mm.t - Cr, 0°, 6mm.t
		11					×		
		12					×		
							×		
							×		
							×		J, SUBVERTICAL, P, S
		13		END OF BOREHOLE AT 12.80m					
		14							
		15							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **106** 1/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA2 **Method:** SPIRAL AUGER JK450 **R.L. Surface:** 9.97m

Date: 30-10-03 **Datum:** AHD

Logged/Checked by: A.J.H./A.J.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty clay, medium to high plasticity, brown, with concrete and brick fragments.	MC>PL			
				■		1		CH	SILTY CLAY: high plasticity, red brown mottled light grey.	MC>PL	St	200 190 180	ALLUVIAL HP TESTS CARRIED OUT ON A REMOULDED SAMPLE
						2							
						3		CL	SILTY SANDY CLAY: low to medium plasticity, brown mottled light grey, fine grained sand and occasional clayey sand bands.	MC≅PL	(VSt-H)		
						4		CL	SILTY CLAY: low plasticity, orange brown, with fine grained sand.				
				■	N = 34 12,14,20	5		SP	SAND: fine to medium grained, orange brown, with occasional clayey sand bands.	M	D		
▼ ON COMPLETION OF CORING						6		CL	SILTY CLAY: medium plasticity, light brown, with fine to medium grained sand.	MC>PL	(St-VSt)		
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 106 2/3

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA2 **Method:** SPIRAL AUGER JK450 **R.L. Surface:** 9.97m

Date: 30-10-03 **Datum:** AHD

Logged/Checked by: A.J.H./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						8		CL	SILTY CLAY: medium plasticity, light brown, with fine to medium grained sand.	MC>PL	St- VSt	180 190 210	HP TESTS CARRIED OUT ON REMOULDED AUGER SAMPLE
						9		-	SHALE: dark grey.	DW	VL	-	VERY LOW 'TC' BIT RESISTANCE
						10			as above, but dark grey brown.	SW-Fr	M-H		LOW TO MODERATE RESISTANCE
									REFER TO CORED BOREHOLE LOG				
						11							
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No. 106 3/3

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA2 **Core Size:** NMLC **R.L. Surface:** 9.97m

Date: 30-10-03 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK450 **Bearing:** - **Logged/Checked by:** A.J.H.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		9							
		10		START CORING AT 10.13m					
FULL RETURN		11		SHALE: dark grey, with fine grained sandstone laminae, bedded at 0-5°, spacing 0-20mm.	SW-Fr	M-H	×		- Cr, 0°, 15mm.t
		12				H	×		- LOW STRENGTH SEAM, 0°, 5mm.t
		13					×		- LOW STRENGTH SEAM, 0°, 8mm.t - LOW STRENGTH SEAM, 0°, 4mm.t
				END OF BOREHOLE AT 13.13m			×		
		14							
		15							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **201** 1/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Method:** SPIRAL AUGER JK550 **R.L. Surface:** 9.54m

Date: 8-7-04 **Datum:** AHD

Logged/Checked by: N.S./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Gravelly silty sand, fine to medium grained, brown grey, fine to medium grained crushed concrete and ceramic gravel.	D			
									FILL: Silty clay, medium plasticity, brown, with fine to medium grained gravel.	MC<PL			
						1		CH	SILTY CLAY: high plasticity, red brown.	MC>PL	(VSt)		ALLUVIAL
						2							
								CL	SILTY CLAY: medium plasticity, grey mottled red brown.	MC<PL	(H)		
						3							
▶						4		CL	SANDY CLAY: medium plasticity, red brown.	MC>PL			POSSIBLY 'PERCHED' GROUNDWATER
						5							
								CH	SILTY CLAY: high plasticity, light brown grey.		(VSt)		
						6							
								SC	CLAYEY SAND: fine to medium grained, light grey.	M	-		
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 201
2/3

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Method:** SPIRAL AUGER JK550 **R.L. Surface:** 9.54m

Date: 8-7-04 **Datum:** AHD

Logged/Checked by: N.S./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
▶								SM	SILTY SAND: fine to medium grained, brown, with a trace of clay.	M			
										W			
▼ ON COMPLETION OF AUGERING						8							
						9		SC	CLAYEY SAND: fine to medium grained, grey.				
						10		-	SHALE: dark grey.	DW	VL / M	-	VERY LOW 'TC' BIT RESISTANCE
									REFER TO CORED BOREHOLE LOG				LOW TO MODERATE RESISTANCE
						11							
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **201** 3/3

CORED BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Core Size:** NMLC **R.L. Surface:** 9.54m

Date: 8-7-04 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK550 **Bearing:** - **Logged/Checked by:** N.S./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		9							
		10		START CORING AT 10.58m					
FULL RET-URN		11		SHALE: dark grey, with light grey, fine grained sandstone laminae, bedded at 0-5°.	SW-Fr	H	×		CS, 0°, 60mm.t
		12					×		J, 30°, P, R Cr, 0°, 4mm.t
		13					×		
				END OF BOREHOLE AT 13.38m			×		
		14							
		15							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **202** 1/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Method:** SPIRAL AUGER JK550 **R.L. Surface:** 9.47m

Date: 8-7-04 **Datum:** AHD

Logged/Checked by: N.S./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty gravelly sand, fine to medium grained, grey brown, fine to medium grained crushed concrete and ceramic gravel.	D			
									FILL: Silty clay, medium plasticity, brown, with fine to medium grained gravel.	MC > PL			
						1		CH	SILTY CLAY: high plasticity, orange brown.	MC≅PL	(VSt)	-	ALLUVIAL
						2		CL	SILTY CLAY: medium plasticity, grey mottled orange brown.	MC < PL	(H)		
						3			SANDY CLAY: low to medium plasticity, orange brown.	MC > PL	(VSt-H)		
						4							
						5		SM	SILTY SAND: fine to medium grained, light brown yellow.	M	-		
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **202** 2/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Method:** SPIRAL AUGER JK550 **R.L. Surface:** 9.47m

Date: 8-7-04 **Datum:** AHD

Logged/Checked by: N.S./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SM	SILTY SAND: fine to medium grained, brown.	W	-		
						8			as above, but dark grey, with a trace of clay.				
▼ ON COMPLETION OF AUGERING						9							
				■		10		-	SHALE: dark grey.	SW	M		LOW TO MODERATE 'TC' BIT RESISTANCE
									REFER TO CORED BOREHOLE LOG				
						11							
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **202** 3/3

CORED BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Core Size:** NMLC **R.L. Surface:** 9.47m

Date: 8-7-04 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK550 **Bearing:** - **Logged/Checked by:** N.S./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		9							
		10		START CORING AT 10.25m					
FULL RETURN				SHALE: dark grey.	SW	M	×		- XWS, 0°, 70mm.t - FRAGMENTED ZONE, 80mm.t - J, 70°, Un, S
		11		as above, but with light grey, fine grained sandstone laminae, bedded at 0-5°.	SW-Fr	H	×		
		12					×		
		13					×		
				END OF BOREHOLE AT 13.29m					
		14							
		15							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 203 1/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Method:** SPIRAL AUGER JK550 **R.L. Surface:** 9.74m

Date: 9-7-04 **Datum:** AHD

Logged/Checked by: N.S./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty sand, fine to medium grained, light grey brown, with fine to coarse grained sandstone gravel.	M			
									FILL: Silty clay, high plasticity, red brown.	MC<PL			
						1							
						2			FILL: Silty clay, high plasticity, dark brown mottled grey and red brown.	MC>PL			
								CL	SILTY CLAY: medium plasticity, light grey.	MC<PL	(H)	-	ALLUVIAL
						3		SM	SILTY SAND: fine to medium grained, light yellow brown.	M	-		
						4							
						5							
▼ AT 2 HRS AFTER COMPLETION OF CORING						6			as above, but orange and light brown.				
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **203** 2/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Method:** SPIRAL AUGER JK550 **R.L. Surface:** 9.74m

Date: 9-7-04 **Datum:** AHD

Logged/Checked by: N.S./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SM	SILTY SAND: fine to medium grained, orange and light brown.	M	-		
									SILTY SAND: fine to medium grained, brown, with a trace of clay and cemented seams.				
						8		CL	SANDY CLAY: low plasticity, grey.	MC<PL	(H)		
▶ ON COMPLET -ION OF AUGER- ING									as above, but brown.				
						9							
						10		-	SHALE: dark grey, with XW seams.	DW	VL	-	VERY LOW 'TC' BIT RESISTANCE
									SHALE: grey. REFER TO CORED BOREHOLE LOG		L-M		MODERATE RESISTANCE
						11							
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **203** 3/3

CORED BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Core Size:** NMLC **R.L. Surface:** 9.74m

Date: 9-7-04 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK550 **Bearing:** - **Logged/Checked by:** N.S./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		9							
		10		START CORING AT 10.33m					
FULL RETURN				SHALE: grey and brown.	DW	L-M	×		- XWS, 0°, 40mm.t
				CORE LOSS 0.06m	SW	L-M			- XWS, 0°, 90mm.t
		11		SHALE: dark grey, with light grey, fine grained sandstone laminae, bedded at 0-10°.			×		
					SW-Fr	H	×		- Cr, 0°, 11mm.t
		12					×		
							×		
		13					×		
				END OF BOREHOLE AT 13.31m					
		14							
		15							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **204** 1/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Method:** SPIRAL AUGER JK550 **R.L. Surface:** 9.80m

Date: 9-7-04 **Datum:** AHD

Logged/Checked by: N.S./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty sand, fine to medium grained, brown grey, with fine to coarse grained sandstone gravel.	M			
						1			FILL: Silty clay, high plasticity, brown.	MC>PL			
								CL	SILTY CLAY: medium plasticity, red brown.	MC≅PL	(H)	-	ALLUVIAL
						2				MC>PL			
						3		CL/SC	SANDY CLAY/CLAYEY SAND: low plasticity, fine to medium grained, grey.	MC>PL/ M	-		
								SM	SILTY SAND: fine to medium grained, orange light brown.	M			
						4			as above, but with grey clayey sand seams.				
									SILTY SAND: fine to medium grained, orange brown.				
▼ ON COMPLETION OF CORING						5							
						6		CH	SILTY CLAY: high plasticity, grey.	MC>PL	(H)		
								CL	SILTY CLAY: medium plasticity, brown and grey.	MC≅PL			
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **204** 2/3

BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Method:** SPIRAL AUGER JK550 **R.L. Surface:** 9.80m

Date: 9-7-04 **Datum:** AHD

Logged/Checked by: N.S./ AJ

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								CL	SILTY CLAY: medium plasticity, brown and grey.	MC≅PL	(H)		
						8			as above, but with cemented sand seams.				
▼ ON COMPLETION OF AUGERING						9		CH	SILTY CLAY: high plasticity, brown grey, with a trace of fine grained sand.	MC > PL			
						10		-	SHALE: grey.	MC≅PL DW	H		MODERATE 'TC' BIT RESISTANCE
									as above, but brown grey. REFER TO CORED BOREHOLE LOG				
						11							
						12							
						13							
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **204** 3/3

CORED BOREHOLE LOG

Client:

Project: PROPOSED NEW MENTAL HEALTH CENTRE

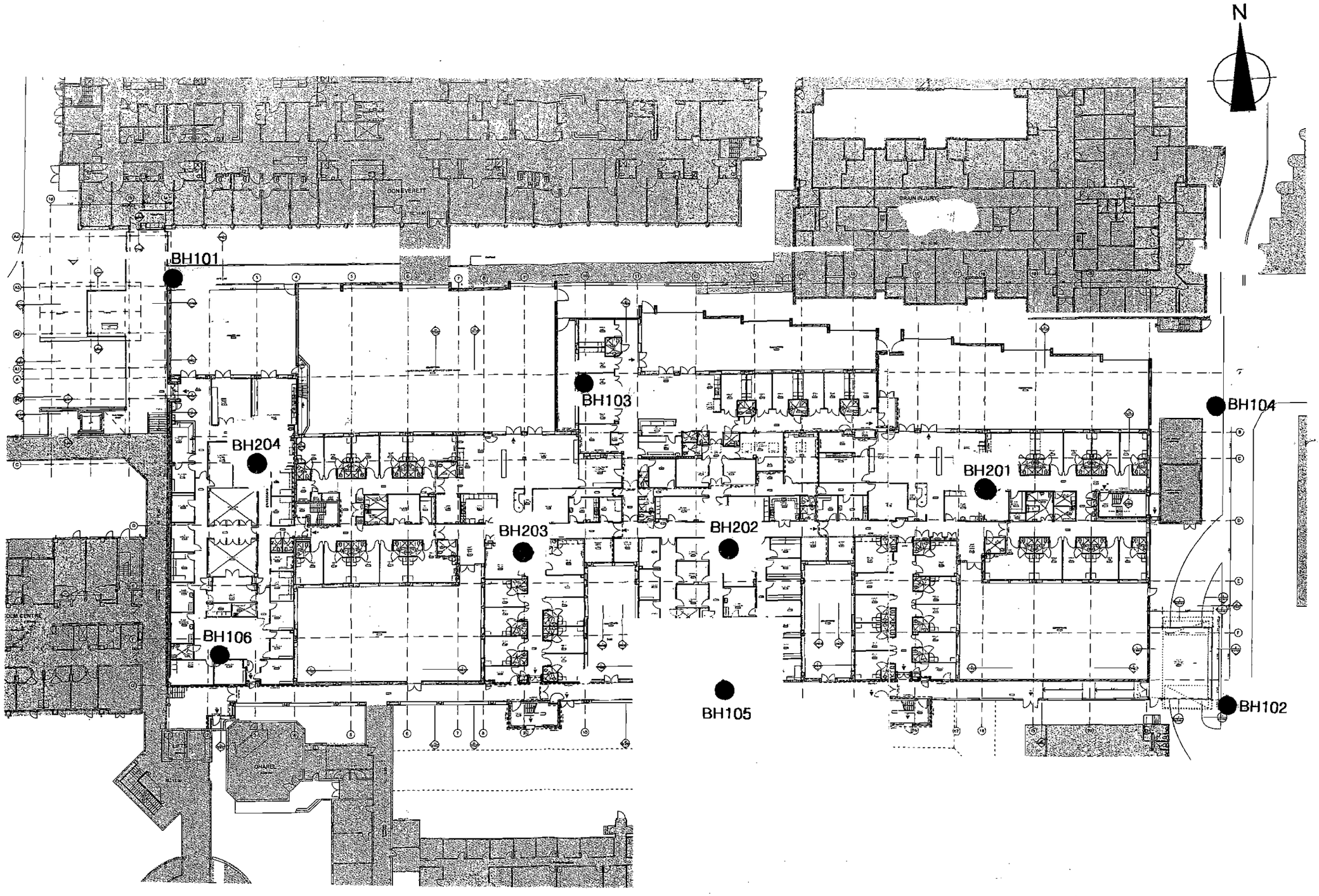
Location: LIVERPOOL HOSPITAL, NSW

Job No. M17359WA4 **Core Size:** NMLC **R.L. Surface:** 9.80m

Date: 9-7-04 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK550 **Bearing:** - **Logged/Checked by:** N.S./A.J

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		9							
		10		START CORING AT 10.18m					
80% RET-URN		11		SHALE: dark grey, with light grey, fine grained sandstone laminae, bedded at 0-5°.	SW-Fr	H	×		- XWS, 0°, 4mm.t
				CORE LOSS 0.03m	SW-Fr	H			- Cr, 30mm.t - Cr, 10mm.t
100% RET URN		12		SHALE: dark grey, with light grey, fine grained sandstone laminae, bedded at 0-5°.			×		- XWS, 5°, 3mm.t
		13					×		
		14					×		
							×		
		15		END OF BOREHOLE AT 14.48m					



SCALE (M)

0 25

BOREHOLE LOCATION PLAN

Jeffery and Katauskas Pty Ltd

Report No. **M17359WA4** Figure No. **1**

APPENDIX G

Relevant Borehole Logs and Borehole Location Plan from Previous Report, Ref: M17485WZA dated 24 April 2003

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1 1/3

BOREHOLE LOG

Client:

Project: PROPOSED LIVERPOOL CBD RIVER BOARDWALK

Location: BETWEEN LIGHTHORSE PARK AND LIVERPOOL HOSPITAL, LIVERPOOL. NSW

Job No. M17485WZA **Method:** SPIRAL AUGER JK550 **R.L. Surface:** N/A

Date: 14-3-03 **Datum:**

Logged/Checked by: A.J./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL; Silty clay, high plasticity, dark brown and various colours, with fine to coarse grained angular igneous gravel.	MC > PL			GRAVEL SURFACING APPEARS POORLY COMPACTED
				■	N = 9 2,4,5			CL	SILTY CLAY: low to medium plasticity, light brown mottled grey, with a trace of fine grained sand.	MC > PL	St- VSt	140 180 220	ALLUVIAL
						1		CH	SILTY CLAY: high plasticity, dark grey mottled orange and red brown, with a trace of rootlets.	MC < PL	H		
				■	N = 12 5,5,7							>600 >600 >600	
						2							
				■	N = 26 5,11,15	3			as above, but with ironstone gravel bands.			500 510 >600	
						4			SILTY CLAY: high plasticity, light brown mottled grey, with occasional ironstone gravel bands.				
				■	N = 36 8,15,21							>600 >600 >600	
						5							
				■	N = 27 13,15,12	6		SP	SAND: fine to medium grained, pale grey, light brown and brown, with silt fines.	M	MD		
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1 2/3

BOREHOLE LOG

Client:

Project: PROPOSED LIVERPOOL CBD RIVER BOARDWALK

Location: BETWEEN LIGHTHORSE PARK AND LIVERPOOL HOSPITAL, LIVERPOOL. NSW

Job No. M17485WZA **Method:** SPIRAL AUGER JK550 **R.L. Surface:** N/A

Date: 14-3-03 **Datum:**

Logged/Checked by: A.J./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SP	SAND: fine to medium grained, grey, light brown and brown, with silt fines.	M	MD		
					N = 41 14,20,21	8			as above, but fine to coarse grained, dark brown.		D		
ON COMP-LETION								CL	SILTY CLAY: low to medium plasticity, grey mottled orange brown, with a trace of fine to coarse grained sand.	MC>PL	St- VSt		
					N = 19 5,8,11	9						180 410 320	
						10		SC	CLAYEY SAND: fine to coarse grained, grey mottled orange brown, with a trace of silt fines.	W	MD		
					N > 30 10, 30/140mm END	11		CL	GRAVELLY SILTY CLAY: low plasticity, orange brown and red brown, fine to medium grained sub-angular ironstone gravel.	MC>PL	(St-VSt)		TOO GRAVELLY FOR HP TESTING
								SC	CLAYEY SAND: fine to coarse grained, dark brown.	W	(MD)		
					N = 10 4,4,6	12		CH	SILTY CLAY: high plasticity, grey, with brown, silty clay seams of low plasticity.	MC>PL	VSt	250 350	
						13		SM	SILTY SAND: fine to medium grained, grey brown, with silty clay bands and a trace of clay fines.	W	MD		
					N = 16 5,7,9	14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1 3/3

BOREHOLE LOG

Client:

Project: PROPOSED LIVERPOOL CBD RIVER BOARDWALK

Location: BETWEEN LIGHTHORSE PARK AND LIVERPOOL HOSPITAL, LIVERPOOL. NSW

Job No. M17485WZA **Method:** SPIRAL AUGER JK550 **R.L. Surface:** N/A

Date: 14-3-03 **Datum:**

Logged/Checked by: A.J./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SM	SILTY SAND: fine to medium grained, grey brown, with silty clay bands and a trace of clay fines.	W	MD		
					N = 19 4,7,12	15			as above, but fine to coarse grained, dark brown, with a trace of fine to medium grained, rounded river gravel.				
						16							
						17							
						18		-	SHALE: dark grey.	SW	L-M	-	VERY LOW TO LOW 'TC' BIT RESISTANCE
						19					M-H		LOW TO MODERATE RESISTANCE
									END OF BOREHOLE AT 19.7m				
						20							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 5
1/3

Client:

Project: PROPOSED LIVERPOOL CBD RIVER BOARDWALK

Location: BETWEEN LIGHTHORSE PARK AND LIVERPOOL HOSPITAL, LIVERPOOL. NSW

Job No. M17485WZA **Method:** SPIRAL AUGER JK250 **R.L. Surface:** N/A

Date: 7-4-03 **Datum:**

Logged/Checked by: M.S. / A.J.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
					N = 5 1/300mm, 5	0			FILL: Silty clay, medium plasticity, mottled grey, red and orange.	MC < PL			APPEARS POORLY COMPACTED
					N > 14 24,14/ 110mm REFUSAL	1		SM	SILTY SAND: fine grained, light grey and orange.	D	MD	-	ALLUVIAL
					N = 28 14,14,14	3							
					N = 19 6,13,6	4		SP	SAND: fine to medium grained, red brown, with occasional ironstone gravel bands and clay bands, with a trace of silt fines.	M		300	HP TESTING CARRIED OUT ON CLAY BAND
▼ ON COMP-LETION						5		SC	CLAYEY SAND: medium to coarse grained, lght grey and orange, with a trace of silt fines.			290	
▶					N = 20 5,8,12	6				W			
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 5 2/3

BOREHOLE LOG

Client:

Project: PROPOSED LIVERPOOL CBD RIVER BOARDWALK

Location: BETWEEN LIGHTHORSE PARK AND LIVERPOOL HOSPITAL, LIVERPOOL. NSW

Job No. M17485WZA **Method:** SPIRAL AUGER JK250 **R.L. Surface:** N/A

Date: 7-4-03 **Datum:**

Logged/Checked by: M.S. /A.9

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SC	CLAYEY SAND: medium to coarse grained, light grey and orange, with a trace of silt fines.	W	MD		
				■	N = 11 4,5,6	8		CL	SANDY CLAY: low to medium plasticity, light grey and orange, with silt fines.	MC>PL	St- VSt	210 190 220	
						9		SP	SAND: fine to medium grained, light brown and orange brown, with a trace of fine to medium grained, sub-angular, river gravel.	W	MD		
				■	N = 27 6,11,16	10							
						11							⊤ 50mm
				■		12		CH	SANDY CLAY: high plasticity, dark grey, with a trace of silt fines, with occasional shale gravel bands and fine to medium grained, sub-angular river gravel.	MC>PL	St- VSt		⊤ 40mm
				■		13							⊤ 70mm
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 5 3/3

Client:

Project: PROPOSED LIVERPOOL CBD RIVER BOARDWALK

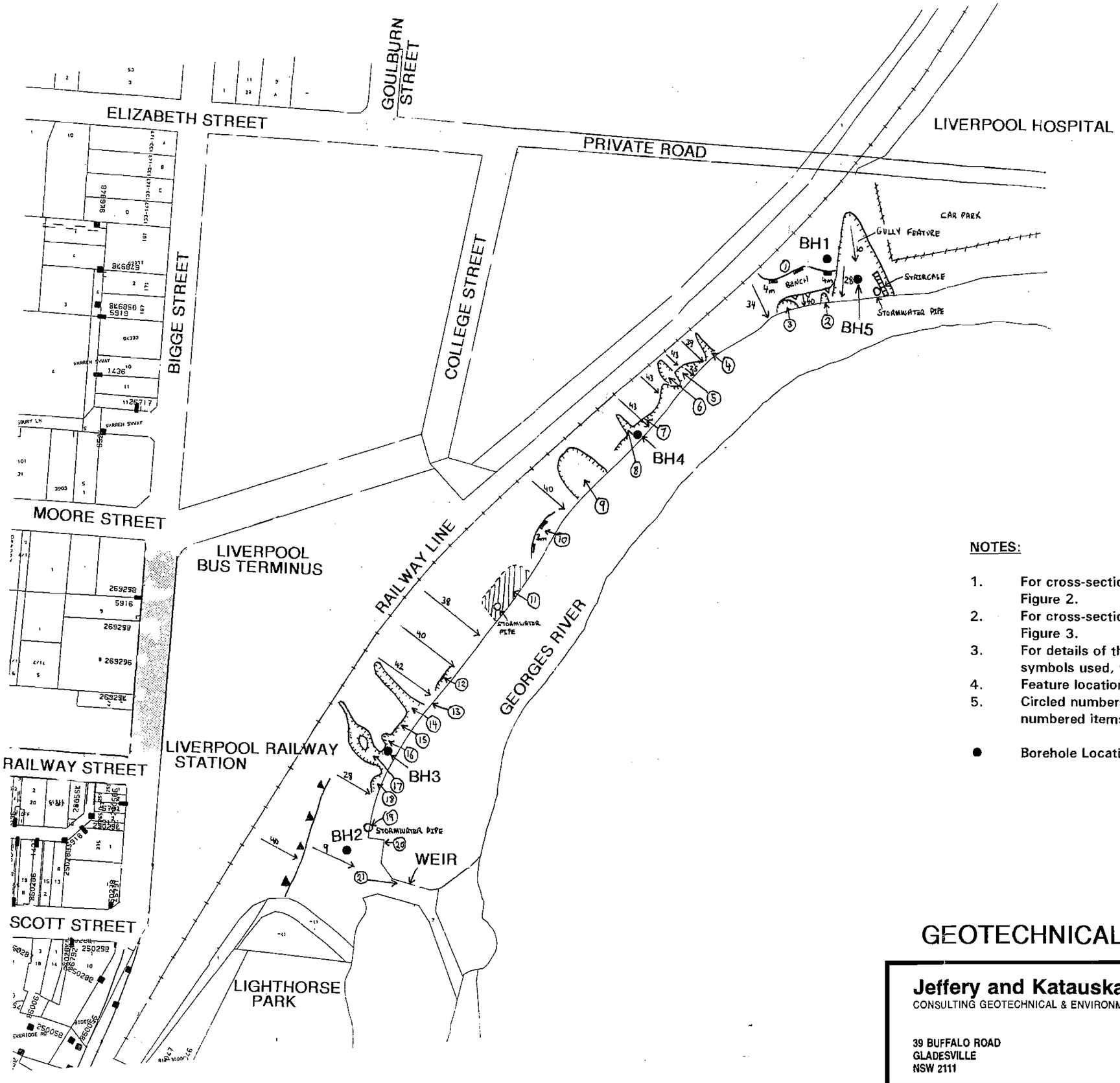
Location: BETWEEN LIGHTHORSE PARK AND LIVERPOOL HOSPITAL, LIVERPOOL. NSW

Job No. M17485WZA **Method:** SPIRAL AUGER JK250 **R.L. Surface:** N/A

Date: 7-4-03 **Datum:**

Logged/Checked by: M.S. / [illegible]

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
									SHALE: dark grey.	SW	M		MODERATE 'TC' BIT RESISTANCE
						15			END OF BOREHOLE AT 15.0m				
						16							
						17							
						18							
						19							
						20							



APPROXIMATE SCALE (M)

0 125

NOTES:

1. For cross-sectional sketch at BH3, refer to Figure 2.
2. For cross-sectional sketch at BH4, refer to Figure 3.
3. For details of the geotechnical mapping symbols used, refer to Figure 4.
4. Feature locations are approximate only.
5. Circled numbers corresponded to the numbered items in Section 3.1 of report.

● Borehole Location

GEOTECHNICAL SITE PLAN

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

39 BUFFALO ROAD
GLADESVILLE
NSW 2111

Tel: 02-9809 7322
Fax: 02-9809 7626

Report No. M17485WZA Figure No. 1

APPENDIX H

Summary of Soil Sulphate, Chloride and pH Test Results (LabPoint Pty Ltd)

11 JUL 2006

Report No: NAA06 - 1383

LabPoint
LabPoint Pty Ltd
ABN 82 096 903 749
Phone: (02) 9624 5588
Fax: (02) 9624 2266
E-Mail: labpoint@bigpond.net.au
Unit 31, 35 Foundry Road
Seven Hills NSW 2147
P.O.Box 177
Kings Langley 2147

Date Received: 23/06/2006

Order No: C.O.C 23/06/06

Attention: Mr. Ashwin Tatikonda

Soil Test Services Pty Ltd
Unit 3, 39 Buffalo Rd
GLADESVELLE NSW 2111

Type of Samples: Eight soil samples - Job No. M20303ZA. Analysed 'as received'

Tests	BH 1001 1.3-1.75m	BH 1002 2.0-2.4m	BH 1003A 4.4-4.95m	BH 1004 3.5-4.0m	Methods
Sulphate	132	53	128	21	AS 1289 D2.1 1997 & APHA 4500 SO_4^{2-} - E
Chloride	155	118	149	<100	NSW.AES.030
pH	5.5	5.1	5.7	5.6	AS 1289 4.3.1 - 1997

Note: Units: mg/kg dryweight for soils except soil pH. Analysed "as received".

Samples will be disposed of seven days after issue of this report unless otherwise notified.

The above soil samples have been prepared by customer as follows:

(a) Oven dried at 50 C

(b) Sieved over 2.36 mm sieve

Rama Bhat

Dr Rama Bhat
Manager Environmental Services
Date Issued: 29/06/2006

NATA ACCREDITED FOR TECHNICAL COMPETENCE

This document is issued in accordance with NATA's accreditation requirements.

Accreditation for compliance with ISO/IEC 17025
Laboratory No. 11111

Type of Samples: Eight soil samples - Job No. M20303ZA. Analysed 'as received'

Tests	BH 1005 0.5-0.95m	BH 1006 4.0-4.2m	BH 1007 0.5-0.95m	BH 1008 3.0-3.45m	Methods
Sulphate	90	21	37	98	AS 1289 D2.1 1997 & APHA 4500 SO_4^{2-} - E
Chloride	156	<100	<100	<100	NSW.AES.030
pH	5.3	7.0	5.5	5.1	AS 1289 4.3.1 - 1997

Note: Units: mg/kg dryweight for soils except soil pH. Analysed "as received".

Samples will be disposed of seven days after issue of this report unless otherwise notified.

The above soil samples have been prepared by customer as follows:

(a) Oven dried at 50 C

(b) Sieved over 2.36 mm sieve

Dr Rama Bhat
Manager Environmental Services
Date Issued: 29/06/2006

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
ABN 17 003 550 801

REPORT EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, the SAA Site Investigation Code. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the grading of other particles present (eg sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose	less than 4
Loose	4 – 10
Medium dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 – 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 – 400
Hard	Greater than 400
Friable	Strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, "Shale" is used to describe thinly bedded to laminated siltstone.

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All except test pits, hand auger drilling and portable dynamic cone penetrometers require the use of a mechanical drilling rig which is commonly mounted on a truck chassis.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as hard clay, gravel or ironstone, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table. Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock fragments.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term "mud" encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses are determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the top end of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" – Test F3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13

  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N>30

  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

A modification to the SPT test is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as "N_c" on the borehole logs,

together with the number of blows per 150mm penetration.

Static Cone Penetrometer Testing and Interpretation: Cone penetrometer testing (sometimes referred to as a Dutch Cone) described in this report has been carried out using an Electronic Friction Cone Penetrometer (EFCP). The test is described in Australian Standard 1289, Test F5.1.

In the tests, a 35mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between EFCP and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of EFCP values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a sliding hammer and counting the blows for successive 100mm increments of penetration.

Two relatively similar tests are used:

- Cone penetrometer (commonly known as the Scala Penetrometer) – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS1289, Test F3.2). The test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various Road Authorities.
- Perth sand penetrometer – a 16mm diameter flat ended rod is driven with a 9kg hammer, dropping 600mm (AS1289, Test F3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.

LOGS

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

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

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

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

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

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg bricks, steel etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg to a twenty storey building). If this happens, the company will be pleased to review the report and the sufficiency of the investigation work.

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

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.

If these occur, the company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

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

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. License to use the documents may be revoked without notice if the Client is in breach of any objection to make a payment to us.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer.

SITE INSPECTION

The company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

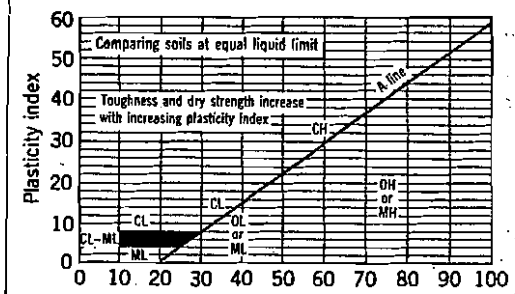
Requirements could range from:

i) a site visit to confirm that conditions exposed are no worse than those interpreted, to
ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or
iii) full time engineering presence on site.

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

UNIFIED SOIL CLASSIFICATION TABLE

Field Identification Procedures (Excluding particles larger than 75 μm and basing fractions on estimated weights)						Group Symbols[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils: More than half of material is *larger* than 75 μm sieve size[b] (The 75 μm sieve size is about the smallest particle visible to naked eye)	Gravels: More than half of coarse fraction is larger than 4 mm sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes			*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name: indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand*, gravelly; about 20% hard, angular gravel particles 12 mm maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than 75 μm sieve size) coarse grained soils are classified as follows: Less than 5% — *GW, GP, SW, SP* More than 12% — *GM, GC, SM, SC* 5% to 12% — *Borderline* cases requiring use of dual symbols $C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing			*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for *GW*
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)			*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		Atterberg limits below "A" line, or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)			*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		Atterberg limits above "A" line, with *PI* greater than 7
	Sands: More than half of coarse fraction is smaller than 4 mm sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes			*SW*	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing			*SP*	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for *SW*
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)			*SM*	Silty sands, poorly graded sand-silt mixtures		Atterberg limits below "A" line or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)			*SC*	Clayey sands, poorly graded sand-clay mixtures		Atterberg limits below "A" line with *PI* greater than 7
Fine-grained soils: More than half of material is *smaller* than 75 μm sieve size	Identification Procedures on Fraction Smaller than 380 μm Sieve Size		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)				Use grain size curve in identifying the fractions as given under field identification
	Silts and clays: liquid limit less than 50		None to slight	Quick to slow	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)	
			Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity		
	Silts and clays: liquid limit greater than 50		Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays		
			Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity		
Highly Organic Soils			Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils		



Plasticity chart
for laboratory classification of fine grained soils

NOTE: 1) Soils possessing characteristics of two groups are designated by combinations of group symbols (e.g. GW-GC, well graded gravel-sand mixture with clay fines).

2) Soils with liquid limits of the order of 35 to 50 may be visually classified as being of medium plasticity.

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

GRAPHIC LOG SYMBOLS FOR SOILS AND ROCKS

SOIL


FILL


TOPSOIL


CLAY (CL, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CH)


SILTY CLAY (CL, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML)


PEAT AND ORGANIC SOILS

ROCK


CONGLOMERATE


SANDSTONE


SHALE


SILTSTONE, MUDSTONE, CLAYSTONE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

DEFECTS AND INCLUSIONS


CLAY SEAM


SHEARED OR CRUSHED SEAM


BRECCIATED OR SHATTERED SEAM/ZONE


IRONSTONE GRAVEL


ORGANIC MATERIAL

OTHER MATERIALS


CONCRETE


BITUMINOUS CONCRETE, COAL


COLLUVIUM

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

A.B.N. 17 003 550 801 A.C.N. 003 550 801

LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record		Standing water level. Time delay following completion of drilling may be shown.
		Extent of borehole collapse shortly after drilling.
		Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	ES	Soil sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'R' as noted below.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60 degree solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25	Vane shear reading in kPa of Undrained Shear Strength.
	PID = 100	Photoionisation detector reading in ppm (Soil sample headspace test).
Moisture Condition (Cohesive Soils)	MC > PL	Moisture content estimated to be greater than plastic limit.
	MC ≈ PL	Moisture content estimated to be approximately equal to plastic limit.
	MC < PL	Moisture content estimated to be less than plastic limit.
(Cohesionless Soils)	D	DRY - runs freely through fingers.
	M	MOIST - does not run freely but no free water visible on soil surface.
	W	WET - free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS	VERY SOFT - Unconfined compressive strength less than 25kPa
	S	SOFT - Unconfined compressive strength 25-50kPa
	F	FIRM - Unconfined compressive strength 50-100kPa
	St	STIFF - Unconfined compressive strength 100-200kPa
	VSt	VERY STIFF - Unconfined compressive strength 200-400kPa
	H	HARD - Unconfined compressive strength greater than 400kPa
	( )	Bracketed symbol indicates estimated consistency based on tactile examination or other tests.
Density Index/ Relative Density (Cohesionless Soils)		**Density Index (Ib) Range (%)** — **SPT 'N' Value Range (Blows/300mm)**
	VL	Very Loose — < 15 — 0-4
	L	Loose — 15-35 — 4-10
	MD	Medium Dense — 35-65 — 10-30
	D	Dense — 65-85 — 30-50
	VD	Very Dense — > 85 — > 50
	( )	Bracketed symbol indicates estimated density based on ease of drilling or other tests.
Hand Penetrometer Readings	300 250	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise.
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Tungsten carbide wing bit.
	T 60	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.

Ref: Standard Sheets Log Symbols
August 2001

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

A.B.N. 17 003 550 801 A.C.N. 003 550 801

LOG SYMBOLS

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered rock	XW	Rock is weathered to such an extent that it has "soil" properties, ie it either disintegrates or can be remoulded, in water.
Distinctly weathered rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly weathered rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh rock	FR	Rock shows no sign of decomposition or staining.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Journal of Rock Mechanics, Mining, Science end Geomechanics. Abstract Volume 22, No 2, 1985.

TERM	SYMBOL	Is (50) MPa	FIELD GUIDE
Extremely Low:	EL	0.03	Easily remoulded by hand to a material with soil properties.
Very Low:	VL	0.1	May be crumbled in the hand. Sandstone is "sugary" and friable.
Low:	L	0.3	A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
Medium Strength:	M	1	A piece of core 150mm long x 50mm dia. can be broken by hand with difficulty. Readily scored with knife.
High:	H	3	A piece of core 150mm long x 50mm dia. core cannot be broken by hand, can be slightly scratched or scored with knife; rock rings under hammer.
Very High:	VH	10	A piece of core 150mm long x 50mm dia. may be broken with hand-held pick after more than one blow. Cannot be scratched with pen knife; rock rings under hammer.
Extremely High:	EH		A piece of core 150mm long x 50mm dia. is very difficult to break with hand-held hammer. Rings when struck with a hammer.

ABBREVIATIONS USED IN DEFECT DESCRIPTION

ABBREVIATION	DESCRIPTION	NOTES
Be	Bedding Plane Parting	Defect orientations measured relative to the normal to the long core axis (ie relative to horizontal for vertical holes)
CS	Clay Seam	
J	Joint	
P	Planar	
Un	Undulating	
S	Smooth	
R	Rough	
IS	Ironstained	
XWS	Extremely Weathered Seam	
Cr	Crushed Seam	
60t	Thickness of defect in millimetres	