# Report on Desktop Geotechnical Assessment

**Raffertys Resort** 

81022062-001.1

Prepared for Iris Raffertys OperationsTrust

24 February 2022







### **Document Information**

Cardno, Now Stantec	Prepared for	Iris Raffertys OperationsTrust
Cardno (NSW/ACT) Pty Ltd		
Business Registration	Project Name	Raffertys Resort
Level 3 Suite 34 207 Albany Street North Gosford NSW 2250 Australia	File Reference	Report on Desktop Geotechnical Assessment - Raffertys Resort Development - 810220062- 001.1.docx
www.cardno.com	Job Reference	81022062-001.1
www.stantec.com Phone (02) 4320 1000	Date	24 February 2022
	Version Number	1
Author(s):		
Jesse Graczyk	Effective Date	24/02/2022
Geotechnical Engineer		
Approved By:		
lan Piper	Date Approved	24/02/2022
Technical Services Manager, Geotechnical		

### **Document History**

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
0	15/02/2022	Draft Issue to the Client	JG	IGP
1	24/02/2022	First issue to Client	JG	IGP

© Cardno. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

# **Table of Contents**

1	Introd	uction	1
	1.1	Purpose and Objectives	1
	1.2	Document Review	1
2	Site D	escription	3
3	Publis	hed Data	4
	3.1	Geological Mapping	4
	3.2	Mine Subsidence	4
	3.3	Acid Sulfate Soils	4
	3.4	Aerial Imagery	5
4	Docur	nent Review	6
	4.1	Documents	6
	4.2	Summary of Subsurface Conditions and laboratory Testing	8
5	Site In	ispection	10
	Geote	chnical Comments and Recommendations	12
6	12		
	6.1	Preliminary Acid Sulfate Soils Assessment	12
	6.2	Groundwater	13
	6.3	Foundation Conditions	13
	6.4	Geotechnical Constraints and Additional Assessment	13
7	Concl	usion	14
8	Limita	tions	15
9	Refere	ences	16

# **Appendices**

Appendix A SITE DRAWINGS

Appendix B PREVIOUS LOGS

# **Tables**

Table 3-1	Soil Landscape Properties	5
Table 4-1	Summary of Subsurface Conditions of Previous Investigations	8
Table 4-2	Summary of Previous Acid Sulfate Soil Testing	9

# **Figures**

Figure 2-1	Proposed Development Layout – EJE Architecture Drawing A5 (North up Page) [1]	3
Figure 2-2	Mecone Mosiaic Aerial Imagery of Lot boundaries and Site in existing condition (North up Pag [7]	e) 3
Figure 3-1	Approximate Published Geological Conditions at the Site – Seamless Geology - Minview [8]	4
Figure 5-1	Photo of Fill Embankment and Batter Slopes (Facing North to North-East)	11
Figure 5-2	Photo of Fill Batters and area of Proposed Site A – Apartment Buildings (Facing North)	11
Figure 5-3	Photo of Site C area (Facing East).	11
Figure 5-4	Photo of trees within envelope of proposed Site D (Facing East).	11

## 1 Introduction

This report presents the findings of a desktop geotechnical assessment undertaken by Cardno, Now Stantec (CnS) for the proposed development at Raffertys Resort, located at Cams Wharf, NSW.

CnS were supplied with a set of architectural Masterplans of the proposed development prepared by EJE Architecture (Rev D, Dated. 2/2/22, Preliminary Consultant Issue) [1]. Based on client briefing and drawing A5 of the architectural set, the major components of the development comprise construction of;

- Site A Residential Apartment –two (2) four-storey residential flat buildings with shared basement carpark and associated pool/landscaping.
- > Site B Tavern two-storey tavern and function centre.
- > Site C Hotel –seven-storey hotel with under croft car parking (2 levels).
- > Site D Residential Apartment –four-storey residential flat building with basement carpark.
- Site E Multi-Unit Housing –eight attached two-storey villas and single garage (and associated car parking along Lorikeet Loop).

The site comprises the proposed development within Lot 30 and 31 in Deposited Plan 270043, which can be seen depicted in Drawing 1 of Appendix A. It should be noted that Site E – Multi-Unit Housing is proposed at Lot 14 in Deposited Plan 270043 to the south. Geotechnical comment on Site E based on desktop geotechnical assessment will be reported under separate cover. Another separate report for Site B will also be prepared and issued.

The report has been prepared to accompany a planning proposal for the development. The works were commissioned by Iris Raffertys OperationsTrust at the request of Mr Warwick Bowyer of Iris Capital.

### 1.1 Purpose and Objectives

The proposed development area and adjacent sites have been subject to a range of previous geotechnical and environmental assessments in the past by Cardno and others. The current assessment comprises review of available previous investigations (where relevant) and published data in conjunction with the provided draft layout plans and a site inspection. The scope of the assessment is to provide geotechnical comment on the following;

- > Suitability of site for the proposed development Site's A, C and D with respect to the geological setting;
- > Preliminary Acid Sulfate Soil Assessment; and
- > Requirements for further investigation.

### 1.2 Document Review

The following report has been prepared based on a review of previous investigations and other documents including;

- Coffey Geosciences Pty Ltd (Coffey) "Lakeside Sector Wallarah Peninsula Geotechnical Soils Investigation" (Ref. N07634/07-AB, Dated. 17/11/2003) [2];
- > Douglas Partners Pty Ltd (DP) "Report on Geotechnical Investigation Wallarah Water and Sewer Project Wallarah" (Ref. 39017, Dated. November 2004) [3];
- Geotech Solutions Pty Ltd (GS) "Preliminary Acid Sulphate Soil Assessment Proposed Subdivision Raffertys Resort – Cams Wharf" (ref. GS577-002/0, Dated. 12/02/2010) [4];
- GS "Contamination Testing Proposed Subdivision Raffertys Resort, Cams Wharf" (ref. GS577-003/0, Dated. 22/02/2010) [5];
- GS "Site Classification Report Raffertys Resort Stage 1 Cams Wharf: (ref. GS577-004/0, Dated October 2011) [6];
- > Published Geological and Acid Sulfate Soils maps; and
- > Online Aerial Imagery.

Intrusive investigation data relevant to the current site has been extracted from the above reports to assist in providing comment on subsurface conditions. Approximate test bore and test pit data can be seen overlayed on aerial imagery in Drawing 2 of Appendix A with relevant engineering logs attached in Appendix B. Comments made in the reports and relevant laboratory testing data have been considered (where appropriate) to assist in the preparation of this report and its recommendations.

It should be noted that subsurface conditions may have changed since the investigations as a result of development and associated earthworks at the site.

## 2 Site Description

The proposed development site is defined as irregular shaped parcels of land situated at existing Rafferty's Resort, Cams Wharf, NSW. The proposed development (Site A to D) is situated with Lot 30 and 31 of DP 270043 and is generally bounded by:

- > Lake Macquarie water front and boat shed facilities to the west;
- > Existing residential development and internal road network to the north, east and south; and
- > A small east-west trending gulley line traversing between proposed Site D and E to the south.

Lorikeet Loop internal road traverses between the lots.

Proposed Site E is situated in Lot 14 of DP 270043 to the south.

Topography at the site is generally categorised by west-facing foot slopes associated with undulating, steep terrain to the further east of the site. A subtle, broad east-west trending spur traverse west through the centre of the site in the envelope of the existing function centre resulting in southwest slopes in the site's southern portion and north-west in the northern portion. An east-west trending gulley line was noted through the southern portion of the site and had evidently been formalised (rock-lined) during previous developments.

The site has been subject to earthworks as a result of the original development resulting in cut and filling to create level building platforms. A few areas of cut and fill have been retained using retaining wall solutions, with others battered at grades in the order of 2H:1V. Natural slopes were estimated to fall at approximately 3-6° and fall towards the Lake Macquarie water edge. Surface run-off expected to follow these trends via formalised stormwater or the gulley line to the south.

A range of existing facilities and structures are present at the site including a facility building (Site B envelope), pool facility (Site A envelope), carpark and existing commercial structures (Site E envelope).

The proposed development and existing layout at the site are depicted below in Figure 2-1 and Figure 2-2. Additional site observations are discussed in Section 5 of this report on the basis of a site walkover.



Figure 2-1 Proposed Development Layout – EJE Architecture Drawing A5 (North up Page) [1]



Figure 2-2 Mecone Mosiaic Aerial Imagery of Lot boundaries and Site in existing condition (North up Page) [7]

# 3 Published Data

### 3.1 Geological Mapping

Review of the Seamless Geology on NSW Government online web mapping application "Minview" [8] indicates that the proposed development Site's A to E are predominantly underlain by the Catherine Hill Bay Formation (**Pnmc**) of the Moon Island Beach Subgroup. This formation is known to comprise Quartz-lithic pebble polymictic conglomerate, quartz-lithic sandstone, shale, carbonaceous shale, coal, tuff and soils derived from the weathering of these rocks.

The northernmost residential apartment building, proposed Site A is mapped as being underlain by Alluvial fan deposits (**Q\_avf**) known to comprise fluvially-deposited quartz-lithic sand, silt, gravel and clay.

Estuarine fluvial delta front (**QH\_ed**) (and sub-aqueous variant **QH\_edw**) associated with Lake Macquarie and its banks are situated west of the site as close as approximately 25 m.



Figure 3-1 Approximate Published Geological Conditions at the Site – Seamless Geology - Minview [8]

### 3.2 Mine Subsidence

A review of New South Wales (NSW) Government Online Planning Portal (ePlanning Spatial Viewer) [9] indicates that the site is situated within the Swansea North Entrance Mine Subsidence District. A review of the Underground Coal Mining layer within the Planning Portal indicates that the site is clear of any mapped historical underground coal mining.

### 3.3 Acid Sulfate Soils

A review of NSW Government only planning portal "ePlanning Spatial Viewer" [9] indicated that the site is mapped as being within a Class 5 (ASS) area. ASS are typically not found within Class 5 areas and are classified as Class 5 as they are located within 500 metres on adjacent class 1,2,3 or 4 land. The adjacent Lake Macquarie water body is mapped as being in a Class 1 area where ASS soils are likely to be found on and below the natural ground surface.

#### 3.3.1 Soil Landscape Maps

A review of soil landscape maps at the site was made using the online information system from Office of Environment and Heritage, Electronic Soil Profiling Maps (eSPADE) V2.1 [10]. The review found the site to be underlain by a range of landscapes summarised in Table 3-1 below.

Table 3-1Soil Landscape Properties

Unit	Locality	Landscape	Soils and Limitations
Wyong- Wy	Predominant landscape across the site	Broad poorly drained deltaic floodplains and alluvial flats of Quaternary sediments. Slopes on the Central Coast Lowlands are <3%; local relief <10 m. Meander scrolls, oxbows, and swamps are common. Extensively cleared open- forest.	Deep (>2m) Yellow Podzxolic Soils, Brown Podzolic Soils, Soloths with some Humus Podzols around lake edges. Limitations include flooding, seasonal waterlogging, foundation hazard, strongly acidic, poorly drained, impermeable soils of very low fertility with saline subsoils. Localised areas may have permanent waterlogging, stream bank erosion and acid sulphate potential.
Doyalson - do	North-east portion of the site and upslope to the east	Gently undulation rises on Munmorah Conglomerate with Slope gradients <10% and local relief <30 m. Broad crests and ridges and long gently inclined slopes.	<ul> <li>Sandstone/Conglomerate Parent - Moderately Deep (0.5-1.5 m) yellow Earths, Yellow Podzolic and Soloths.</li> <li>Siltstone/Claystone Parent – Moderately deep yellow Podzolic Soils, Soloths and some Red Podzolic Soils.</li> <li>Drainage lines – Moderately deep to deep (1.0 to &gt;1.5 m) Yellow Leached Earths, Grey Earths, Soloths and Gleyed Podzolic Soils.</li> <li>Limitations include high erosion hazard, hard setting, stoniness, strongly acidic soils of low fertility and localised foundation hazard, high run-on, seasonal waterlogging.</li> </ul>

Derived from The Office of Environment and Heritage, Electronic Soil Profiling Maps (eSPADE) V2.1 [10].

### 3.4 Aerial Imagery

A range of historical aerial imagery was undertaken for the site from former projects and accessed online from NSW Government's Search and Discovery Historical Imagery Portal [11] and Metromap. Imagery from the following dates were reviewed: 1954, 1965, 1971,1976,1980,1983, 1990 1994, 1996, 2001, 2007, 2010, 2015, 2019 and current.

Key features regarding former works include;

- > Between 1954 and 1984 aerials indicated the site was predominantly undeveloped with what appears to be a few small cottage style structures near the water frontage and south of proposed Site E.
- > The 1990 aerial indicated road pavement construction for Lorikeet Loop and Wild Duck Drive had been undertaken.
- > In the 1994 aerial, what appears to be an access track and fill pad associated with a boat shed had been constructed at the water frontage as well as a jeti.
- > The 1996 aerial depicted earthworks were being undertaken to construct the fill embankment associated with the existing function centre structure.
- > The 2001 aerial indicated construction of the existing function centre, car park and pool facility had been undertaken.
- > The 2007 aerial imagery indicated construction of a structure in the envelope of Site C with the 2010 aerial indicating the structure had been demolished. The 2007 aerial also indicated the construction of commercial structures within the Site E envelope.
- > Construction of residential structures north of proposed Site A commenced in 2015 finishing in 2019.

### 4 **Document Review**

### 4.1 Documents

#### 4.1.1 Coffey, 2003 [2]

In 2003, Coffey undertook a geotechnical investigation for the wider Cams Wharf and Murrays Beach area with the aim of characterising geotechnical conditions at the site likely to impact on future development. Coffey summarised the site into five different geological units based on the investigation, each with unique features and constraints. The area of Raffertys Resort was not given a unit category; however, adjacent land was designated 'D1 – footslopes, broad, open slopes' and 'D2 – Valley Floor units'. Coffey concluded that development in Unit D2 *"is feasible with appropriate geotechnical management and design"*.

Coffey noted that soils in these units based on their investigation are characterised by colluvial and residual over conglomerate in Unit D1 and variable, mostly clayey alluvium/colluvium with sandy lenses and some shallow residual soils in Unit D2. Characteristics of the units included minor ASS potential for D2 areas, minor scour and gulley erosion where not vegetated, low infiltration and boggy ground/ponding expected in lower areas (D2).

Acid Sulfate testing north of the Raffertys Resort at similar reduced levels was undertaken. Based on site observations, screening and detailed testing, Coffey concluded that the soils are not actual or potential ASS. Coffey also recommended further testing to be undertaken once the areas requiring excavation within Unit D2 are defined.

The report also contains data of previous geotechnical investigation undertaken by Coffey in 1997 with a few bores in proximity to the site (BH2-BH5). The boreholes generally indicated Sandy CLAY / Gravelly SAND / Sandy GRAVEL filling materials of depths ranging from 0.6 to 1.2 m bgl which were typically underlain by stiff to very stiff sandy and sandy gravelly CLAYs with variable minor component. Moisture was generally above plastic limit. Alluvial SAND was also encountered in BH5 to 1.1 m bgl underlying the filling. Conglomerate rock was encountered in two bores (BH5 and BH2) with auger refusal encountered at depths of 1.2 and 7.7 m bgl respectively. Groundwater was encountered during drilling at depts ranging from 0.6 to 2.5 m bgl.

#### 4.1.2 Douglas Partner's, 2004 [3]

In 2004, DP undertook a geotechnical investigation for proposed water and sewer infrastructure across the Wallarah Peninsula area (Spanning Caves Beach, Cams Wharf and Swansea). The investigation was undertaken to assess subsurface conditions and provide engineering comment including depth to rock and groundwater, trench support, occurrence of Acid Sulfate Soils (ASS), excavation conditions etc.

Part of the proposed infrastructure comprised a lead in gravity sewer traversing to Rafferty's resort from the north. DP also augmented previous data including boreholes undertaken by Coffey Geosciences Pty Ltd (Coffey) (1997), discussed above in Section 4.1.1.

Intrusive investigation (boreholes) undertaken by DP in proximity to Raffertys Resort generally indicated conditions comprising of SILT and clayey / Gravelly SILT surficial topsoil and fill materials (≤0.7 m bgl) overlying typically firm to very stiff Gravelly / Sandy CLAY and CLAY materials with variable minor components. Clay materials were generally above plastic limit. A layer of loose, wet clayey sand was also encountered at depth (2.4 to 2.7 m). Conglomerate rock was encountered in bores 31 and 32 with auger refusal encountered at a depth of 2.8 m bgl. Seepage was encountered in bore 33 at 2.1 m bgl.

Acid Sulfate Soil (ASS) Screening tests were undertaken on samples obtained from locations of alluvial soils in proximity to the Lake Macquarie water edge. Few of the tests were taken in proximity to Raffertys Resort (BH33 and BH31). DP concluded that the results of the screenings indicate that actual acid sulfate soils are not present at the locations and depths sampled.

DP concluded that as a precautionary measure, it is recommended that a monitoring procedure is drafted, including contingency measures to treat soil (if necessary) during construction.

#### 4.1.3 Geotech Solutions, Preliminary Acid Sulfate Soil Assessment – GS577-002.0, 2010 [4]

In 2010 Geotech Solutions Pty Ltd (GS) undertook a preliminary Acid Sulfate Soil (ASS) Assessment at Raffertys Resort, Cams Wharf for subdivision of an existing lot into unit developments. Three (3) test bores were drilled to a depth of 3.1 to 3.2 m bgl using a 300 mm spiral flight auger attached to a 5t excavator.

The test bores revealed subsurface conditions to generally comprise Gravelly Sandy Clayey SILT topsoil materials overly predominantly very stiff to hard Clays with variable Sand, silt and gravel content. TB01 also

had medium dense gravelly SAND material encountered under the clay materials from a depth of 1.8 m. Groundwater was encountered in all test bores at a depth of 2.5 to 3.0 m bgl.

Based on a range of screening and detailed (SPOCAS) ASS lab tests, it was concluded that the materials tested, while slightly acidic, were below tolerable levels as detailed in ASSMAC and would not be classified as potential or actual acid sulphate soils.

#### 4.1.4 Geotech Solutions, Contamination Testing - GS577-003.0, 2010 [5]

In conjunction with the above Preliminary ASS Assessment, GS undertook preliminary contamination testing at the site. An additional four (4) test bores to the preliminary ASS assessment were drilled across the site for the purpose of the contamination assessment. The test bores (TB004-TB007) were advanced to depths ranging from 0.3 to 1.2 m bgl.

Test bores revealed conditions typically comprising of silty and clayey topsoils overlying hard sandy gravelly CLAYs to depths of 0.8 to 1.0 m bgl overlying Sandy CLAYs. TB007 comprised CLAY fill to 0.3 m bgl (termination depth). No groundwater was encountered in these additional test bores.

Selected samples of the encountered materials were analysed for a range of contaminants with results compared to NEMP 1999 guidelines. All tested samples were either below the laboratory limit of reporting or below compared thresholds.

4.1.5 Geotech Solutions, Site Classification – Raffertys Resort - Stage 1, 2011 – GS577-004.0, 2011 [6]

In 2011, GS undertook site classification of stage 1 of the Raffertys Resort subdivision comprising six allotments and construction of 140 m of road. Test pitting was undertaken within the allotments to a target depth of 1.5 m to 1.7 m bgl with collection of U50 tubes or laboratory testing.

Natural subsurface conditions typically comprised of Silty topsoil (≈0.15 m) overlying a mixture of stiff to very stiff Gravelly Sandy / Sandy CLAYs and medium dense Gravelly SANDs. One test bore comprised Sandy CLAY and gravelly SAND controlled fill material associated with the subdivision earthworks to a depth of 1.5 m bgl. No groundwater was encountered in the test bores; however, observation during subdivision development identified groundwater at variable levels, generally less than 2 m depth. Sitly SAND material was also encountered in TP103 to 0.5 m bgl.

Shrink swell results indicated that the clayey soils at the site encounter in the test pits ranged from slightly to moderately reactive with ISS values of 0.4 to 1.8 %.

#### 4.2 Summary of Subsurface Conditions and laboratory Testing

The Subsurface conditions encountered in the previous intrusive investigations are summarised in Table 4-1 below.

ID	Date	FILL	TOPSOIL	ALLUVIUM/ COLLUVIUM <sup>(2)</sup>	RESIDUAL	WRK	Refusal	Groundwater
-			m bgl	Bottom of layer		m bgl	m	m bgl
TP101 <sup>(3)</sup>	22/09/11	1.5	-	1.7	-	NE	NE	NE
TP102 <sup>(3)</sup>	22/09/11	-	0.15	1.5	-	NE	NE	NE
TP103 <sup>(3)</sup>	22/09/11	-	0.15	1.5	-	NE	NE	NE
TP104 <sup>(3)</sup>	22/09/11	-	0.15	1.5	-	NE	NE	NE
TP105 <sup>(3)</sup>	22/09/11	-	0.15	1.5	-	NE	NE	NE
TB001 <sup>(4)</sup>	22/01/10	-	0.3	3.1	-	NE	NE	2.4
TB002 <sup>(4)</sup>	22/01/10	-	0.25	3.1	-	NE	NE	2.9
TB003 <sup>(4)</sup>	22/01/10	-	0.35	3.2	-	NE	NE	3.0
TB004 <sup>(4)</sup>	22/01/10	-	0.05	1.1	-	NE	NE	NE
TB005 <sup>(4)</sup>	22/01/10	-	0.07	1.1	-	NE	NE	NE
TB006 <sup>(4)</sup>	22/01/10	-	0.25	1.2	-	NE	NE	NE
TB007 <sup>(4)</sup>	22/01/10	0.3	-	-	-	-	NE	
31 <sup>(5)</sup>	29/08/04	-	0.5	2.8	-	2.8	2.8	NE
32(5)	29/08/04	-	0.25	2.4	-	2.4	2.8	NE
33(5)	29/08/04	0.7	-	3.0	-	NE	NE	2.1
34 <sup>(5)</sup>	29/08/04	0.5 <sup>(1)</sup>	-	-	-	NE	NE	NE
BH2 <sup>(6)</sup>	17/12/96	1.2	-	-	5.8	5.8	7.7	2.5
BH3 <sup>(6)</sup>	10/01/97	0.6	-	3.0	-	NE	NE	0.6
BH4 <sup>(6)</sup>	10/01/97	1.3	-	3.0	-	NE	NE	1.3
BH5 <sup>(6)</sup>	10/01/97	0.6	_	1.1	_	1.1	1.2	NE

Table 4-1 Summary of Subsurface Conditions of Previous Investigations

Notes to Table:

NE: Not Encountered

WRK: Weathered Rock

(1) Hand Auger refusal on filling

(2) Where no origin description, materials have been assumed to be alluvium/colluvium.

(3) Test pits undertaken during previous GS site classification [6].

(4) Test bores undertaken during previous GS contamination Assessment [5].

(5) Boreholes undertaken during previous DP investigation [3].
(6) Boreholes referenced in previous Coffey 2003 [2] and DP 2004 [3] investigation reports.

Acid Sulfate Soil testing undertaken at locations in proximity to the proposed development are summarised below in Table 4-2 below.

Table 4-2 below summarises the Acid Sulfate Soil Testing undertaken in previous investigations in proximity to the proposed Rafterys Resort Development.

	TAA TPA TSA ANC <sub>E</sub> S <sub>POS</sub> Net Acidity Liming A													Rate									
					nH-	nH	pH <sub>F</sub> -													a Not	a-Net	Liming	Liming
Location	Depth (m)	Date	Filling (F) /	Material Description	Prif	FOX	рН <sub>FOX</sub>	Reac-	TAA	s-TAA	TPA	s-TPA	TSA	s-TSA	ANCE	$\textbf{a-ANC}_{\text{E}}$	$\textbf{s-ANC}_{\text{E}}$	S <sub>POS</sub>	a-S <sub>POS</sub>	Acidity	Acidity	Rate	Rate
		Sampled	Natural (N)					tion Rate							0/						(-ANCE)	1	(-ANCE)
						pH units	pH units		H+/t	%w/w S	moles H+/t	%w/w S	moies H+/t	%w/w S	% CaCO3	H+/t	%w/w S	%w/w	H+/t	moles H+/t	H+/t	кg CaCO3/t	кg CaCO3/t
			•					Dougl	as Partr	ners Ptv	Ltd (20	04)					•			•			
31	0.45	29/08/04	N	Silty CLAY	6	4.9	1.1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	2.5	29/08/04	N	CLAY	5.5	4.9	0.6	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	0.3	29/08/04	Possible F	Clayey SILT	6	5.6	0.4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	0.6	29/08/04	Possible F	Clayey SILT	6.2	5.1	1.1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	0.8	29/08/04	N	CLAY with sand	5.5	5.1	0.4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	1.2	29/08/04	N	CLAY with sand	6	5.2	0.8	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	1.5	29/08/04	N	CLAY with sand	5.8	5.4	0.4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	2.3	29/08/04	Ν	Sandy CLAY	5.9	5.5	0.4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	2.5	29/08/04	N	Clayey SAND	5.8	5	0.8	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Geotech Solutions Pty Ltd (2010)																						
TB001	TB001 0.5-0.6 22/01/10 N SandyGravellyCLAY 6.3 2.6 3.7 Moderate <2 <0.02 <2 <0.02 <2 <0.02 0.5 100 0.16 <0.02 <10 <10 <10 <1 <10																						
TB001	2.0 - 2.1	22/01/10	N	Clayey SAND / Sandy CLAY	6.4	3.1	3.3	Slight	<2	<0.02	<2	<0.02	<2	<0.02	0.88	175	0.28	<0.02	<10	<10	<10	<1	<10
TB002 0.5-0.6 22/01/10 N Gravelly CLAY						2.4	3.9	Slight	<2	<0.02	<2	<0.02	<2	<0.02	-	-	-	<0.02	<10	<10	<10	<1	<10
TB002	1.5 - 1.6	22/01/10	N	Sandy CLAY	6	3.2	2.8	Slight	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TB003	0.0 - 0.1	22/01/10	N	Clavev SILT	6	2.7	3.3	Moderate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TB003	1.5 -1.6	22/01/10	N	Silty CLAY	6.4	4	2.4	Slight	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Guideline Va	alue		Envirolab POI	-	-	-	-	5	0.01	5	0.01	5.00	0.01	0.05	5	0.05	0.005	5	10	10	0.75	0.75
ASSMAC (1998) Pote	ential Acid Su	ulfate Soil In	dicator Value		4-551	< 3 3	14		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASSMAC (1998) Actu	al Acid Sulfa	te Soil India	cator Value		< 4 <sup>2</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASSMAC (1998) Actio	on Criteria - (	Course Soil	s (1 - 1000 to	nnes) <sup>5</sup>		-	-		_	-	18	-	18	_		-	-	0.03	-	18	18	-	-
ASSMAC (1998) Actio	on Criteria - I	Vedium Soi	ls (1 - 1000 to	onnes) <sup>6</sup>	-	-	-	-	-	-	36	-	36	-	-	-	-	0.06	-	36	36	-	-
ASSMAC (1998) Actio	on Criteria - I	Fine Soils (	1 - 1000 tonne	as) <sup>7</sup>	-	-	-	-	-	-	62	-	62	-	-	-	-	0.10	-	62	62	-	-
ASSMAC (1998) Actio	on Criteria - (	Course Soil	s (>1000 toni	nes) <sup>5</sup>	-	-	-	-	-	-	18	-	18	-	-	-	-	0.03	-	18	18	-	-
ASSMAC (1998) Actio	on Criteria - I	Medium Soi	ls (>1000 ton	nes) <sup>6</sup>	-	-	-	-	-	-	18	-	18	-	-	-	-	0.03	-	18	18	-	-
ASSMAC (1998) Actio	on Criteria - I	Fine Soils (2	>1000 tonnes	) <sup>7</sup>	-	-	-	-	-	-	18	-	18	-	-	-	-	0.03	-	18	18	-	-
Notes to Table:				,																			
1 - pH values >4 and <5	5.5 are acid ar	nd may be the	e result of some	previous or limited oxidation of s	ulfides, but	is not confi	rmatory of	actual acid s	ulfate soils														
2 - pH readings of pH≤4	1, indicates that	at actual acid	sulfate soils a	e present with the sulfides havin	g been oxid	lized in the p	oast, resulti	ing in acid so	oils (and soil	pore w ater	)												
3 - The low er the final p	H <sub>FOX</sub> value is,	the better th	e indication of a	a positive result.																			
» If the pH <sub>FOX</sub> < 3 and the pH <sub>FOX</sub>	nere w as a str	ong reaction	to the peroxide	e, there is a high level of certainty	of a potent	ial acid sulf	ate soils. Th	ne more the p	oH <sub>FOX</sub> drops	below 3, th	e more pos	itive the pre	sence of su	llfides.									
» A pheox 3-4 is less po » For pheox 4-5 the test	is neither pos	oratory analy sitive nor neg	ative. Sulfides	nav be present either in small qua	ntities and	be poorly re	active und	er auick test	field conditi	ons													
» For pH <sub>FOX</sub> >5 and little	or no drop in	pH from the f	field value, little	net acid generating ability is indic	ated.																		
4 - If the pH <sub>FOX</sub> value is	at least one u	nit below fiel	d pH <sub>F</sub> , it may ine	dicate potential acid sulfate soils.	The greater	the differe	nce betw ee	en the tw o m	neasuremen	ts, the more	indicative t	he value is o	of a potentia	I acid sulfat	e soils.								
5 - Course soils compris	se sands to lo	amy sands -	Approximate c	lay content (% < 0.002mm) ≤ 5%																			
6 - Medium soils compri	se sandy loar	ns to light clay	ys - Approxima	te clay content (% < 0.002mm) be	etw een 5 ar	nd 40%																	
7 - Fine soils comprise	medium to hea	ivy clays and	l silty clays - A	oproximate clay content (% < 0.0	02mm) ≥ 40'	%																	
Contaminant Exceedance	ce Indicators:																						
Bold	Indicates the	e laboratory r	esult is within t	he specified range of the ASSMA	C (1998) A	ctual Acid S	Sulfate Soil	Indicator Val	ues														
Italics	Indicates the	e laboratory r	esult either exc	eeds or is within the specified ra	nge of the	ASSMAC(1	998) Potent	tial Acid Sulf	ate Soil India	ator Values													
	Indicates ex	ceedance of	the ASSMAC (	1998) Action Criteria triggering th	e need to p	repare a AS	S Manager	ment Plan															
	Indicates the	e requirement	for localised li	me treatment of the material, that i	s, when the	aboratory	results for	SCr (%w/w	) > 0.03 and	the SCr (m	ole H=/t) >	18											

 Table 4-2
 Summary of Previous Acid Sulfate Soil Testing

### 5 Site Inspection

A site inspection was undertaken by experienced geotechnical consultants from CnS to confirm existing site features and relevance to the development. The following was noted at the time of inspection;

- > A range of existing structures within the proposed development area evidently constructed at different timelines. No obvious visual indications of defects in the buildings were noted.
- > A range of earthworks had been undertaken at the site associated with previous development to construct level building pads and facilitate construction of road pavements. Observations indicated that existing pavements were performing adequately.
- > Vegetation generally comprised of maintained lawns with stands of mature trees.

#### Proposed Site A – Apartment Buildings

- > An existing single storey structure and pool facility is situated within portions of the proposed Site A envelopes.
- > Fill batters associated with the existing function centre to the south-east were noted to encroach the proposed envelope of the southernmost apartment building (Site A).
- > Semi-mature to mature trees were also noted within or close proximity to the envelopes of the Site A apartment buildings.

#### Proposed Site B – Tavern and Function Centre

- > An existing structure was noted within the proposed Tavern and Function Centre envelope.
- > A fill embankment in the order of 2 m high was noted in the envelope, evidently constructed to provide a level building platform for the existing structure given the natural west facing slopes. Consequently, it is likely the eastern portion of the structure is founded in cut to on-grade with minor filling anticipated.
- Batter slopes associated with the embankment were noted to slope generally west towards Lake Macquarie (Figure 5-1) at approximately 2H:1V.

#### Proposed Site C - Hotel

- > The area of Site C high-rise comprised of maintained grass with mature trees and a footpath in the northern portion.
- Landforms generally indicated the area to be formed in minor cutting to filling with the western portion generally level and eastern portion on west facing slopes. Minor filling associated with a demolished former structure and road construction may be present.

#### Proposed Site D – Apartment Building

- > Apartment Building Site D is likely to be on natural soils with potential minor filling based on surrounding topography associated with road construction.
- > A significant amount of semi-mature to mature trees were noted in the proposed building envelope that would require removal.

#### Proposed Site E – Multi-Unit Housing

- > A rock lined water course traversing west between proposed Site D and Site E. Observations indicated that this was formerly a natural gulley line, formalised for aesthetic and ecological conservation purposes.
- > Existing single storey commercial structures were noted within the envelope of the proposed multi-unit housing.
- Surrounding topography indicated that the existing structures on Site E Multi-unit housing apartments were formed via cut to fill operations to form level building platforms with existing filling in the order of 1.0 m anticipated for the westernmost unit.





Figure 5-1 Photo of Fill Embankment and Batter Slopes (Facing North to North-East)

Figure 5-2

5-2 Photo of Fill Batters and area of Proposed Site A – Apartment Buildings (Facing North)



Figure 5-3 Photo of Site C area (Facing East).



Figure 5-4

Photo of trees within envelope of proposed Site D (Facing East).

### **6** Geotechnical Comments and Recommendations

The following recommendations have been made based on available existing data and a limited site inspection. Additional investigation should be undertaken at design phase.

A review of sections [1] and discussions with the client have indicated that the proposed development scheme for the overall area has been deliberately designed to utilise the existing site profiles (where possible) to minimise excavations, Acid Sulfate Soil (ASS) disturbance, groundwater considerations and spoil management where possible. Part of this scheme has allowed the use of under croft car parking as opposed to basements for the larger structures (Sites A, C and D) with aim to reduce groundwater and potential ASS disturbance. Other structures have been designed on-grade (where possible).

A review of the sections in the masterplan architectural plans [1] indicate that the under croft parking will be constructed partially in and partially out of ground due to existing topography. Preliminary indications of excavation depths based on the provided sections include;

- Site A –Varying from minor (<0.5 m) in the west to up to approximately 4.5 m deep in the east to accommodate basement construction and a driveway ramp. The deeper excavations are evidently within the area impacted by the existing fill embankment;
- Site C Varying from ground level to up to approximately 3.5 m deep to accommodate basement level 2 construction; and
- Site D Varying from (<0.5 m) ground level to up to approximately 3.0 m deep to accommodate basement construction.

### 6.1 Preliminary Acid Sulfate Soils Assessment

Previous data in the proposed Rafferty's redevelopment area has been reviewed in order to make preliminary comment on the presence of Acid Sulfate Soils (ASS) at the site. Laboratory testing was undertaken in previous Douglas Partner's [3] and Geotech Solutions [4] assessments with laboratory results summarised in Table 4-2.

As previously stated, review of published mapping b indicates the site is in a Class 5 area where ASS is not typically found with the exception of Lake Macquarie water body to the west mapped as likely encountering ASS (Class 1). It should be noted, that ASS can be found isolating in gulley lines.

As summarised in Table 4-2, preliminary field screening testing was undertaken on samples north of the proposed development on a range of soils to a depth of 2.5 m bgl. The samples were taken in proximity to a natural watercourse discharging to Lake Macquarie.

The results of the field screening returned differences in pH and  $pH_{FOX}$  predominantly of less than 1 when exposed to peroxide, for the 2004 DP testing except for two samples with a difference of 1.1 units. All the Geotech Solutions 2010 samples returned a difference in pH and  $pH_{FOX}$  of 2.4 to 3.9 units. Additional testing using the SPOCAS method on Geotech Solution Samples returned Total Actual (TAA), Potential (TPA) and Sulfuric (TSA) Acidity below reporting limits.

The action criteria indicating the requirements for an Acid Sulfate Soil Management Plan (ASSMP) is detailed in the ASSMAC [12] which suggests values of the percentage of oxidisable sulfur for soil types broadly categorised as fine texture, medium texture and coarse texture. The subsurface profile in proximity to the proposed development area are considered both coarse texture "sands to loamy sands" and fine texture "medium to heavy clays and silty clays".

The action criteria is also based on the extent of the proposed ASS soil disturbance, with various trigger values for where 1-1000 tonnes or where greater than 1000 tonnes is disturbed. Based on the proposed development works, soil volumes of 1000 tonnes are anticipated to be disturbed.

The relevant action criteria where greater than 1000 tonnes of fine, medium or coarse soils is disturbed from Table 4.4 of ASSM [12] is:

- > Sulfur trail of 0.03% or 18 mole H+/tonne; and
- > Acid trail of 18 mole H+/tonne.

With reference to the published ASS mapping and the preliminary results discussed above, it is suggested that the tested soils are slightly acidic but not considered potential or actual acid sulfate soils given the results are below the tolerable levels detailed in the ASSMAC.

Given the proposed developments are within similar nearby terrain and similar distances to the Lake Macquarie water edge, it is likely that no specific treatment will be required for ASS based on previous results. It is recommended that further ASS investigation is undertaken in the proposed disturbance envelopes and to soil disturbance depths during detailed design phase to confirm the presence of any ASS and requirements for any treatment.

As also recommended by DP, a monitoring procedure should be developed containing information on monitoring the presence if ASS during construction and contingency measures for treating soil in encountered. Any treatment is likely to comprise neutralisation by addition and blending of agricultural lime during excavations on site within the specific construction areas. Validation testing following preliminary excavation and dosing would then usually be required to confirm application rates. Following suitable treatment, the material would be suitable for reuse on site as fill.

### 6.2 Groundwater

Based on the previous investigations, groundwater was encountered at depths ranging from 0.6 to 3.0 m bgl at the time of the previous investigations. Groundwater levels are likely to fluctuate with variations in climatic and site conditions, particularly given the sites proximity to Lake Macquarie and its tidal variations.

During construction of a unit subdivision closely to the north of the site, Geotechnical staff from Geotech Solutions noted groundwater at variable levels, generally less than 2 m depth of ground level.

Based on the available information and the site's proximity to Lake Macquarie, it should be anticipated that groundwater will be encountered below natural ground level particularly where excavations exceed 1.0 m and in proximity to any gulley lines such as the gulley between Site's D and E.

It is expected that groundwater will be encountered during development, particularly during the construction of the under croft sections of Site A, C and D where deepest cuts are proposed. As such, waterproofing and drainage solutions will be required subject to further assessment of groundwater levels at the site. Techniques that could be employed during construction where groundwater is encountered would comprise sump and pump techniques. Groundwater considerations should be made during engineer design of any retaining structures, particularly those associated with deeper cuts of the under croft.

### 6.3 Foundation Conditions

Based on existing data at the site and review of the architectural sections, foundation conditions for the proposed Site A, C and D are expected to predominantly comprise either stiff / medium-dense (or better) natural soils or weathered rock encountered at depth. The presence of existing filling at the site as a result of previous development would not be suitable as a foundation material, nor would any firm or loose natural soil materials, topsoil, loose alluvium or any deleterious materials. Where existing filling is at foundation level, this would required to be removed and replaced with suitable controlled filling or founded below these materials.

Geotechnical investigation during design phase of individual elements/structures should be undertaken to confirm subsurface conditions and provide geotechnical parameters for foundation design.

### 6.4 Geotechnical Constraints and Additional Assessment

The preliminary assessment has considered several geotechnical elements at the site including the presence of groundwater, Acid Sulfate Soils (ASS) and foundation conditions. Based on review of the available data, site visit observations and published data review, it is considered that the site is suitable for the proposed development. There are a range of geotechnical considerations for design of the development that will further assessment as part of detailed design and include;

- > Assessment of current groundwater level;
- > Assessment of existing filling in proposed building and pavement;
- > Vegetation removal and impact of roots;
- > Acid Sulfate Soils (ASS);
- > Foundation conditions of the individual elements and provision of geotechnical design parameters;
- > Parameters for Retaining Wall structures;
- > Recommendations for Earthworks and Filling; and
- > Consideration of the presence of underground utilities.

It would also be prudent to undertake a hazardous materials assessment pre-demolition of existing structures.

It should be noted that geotechnical considerations will also be dependent on the proposed design levels and elements of the structure during design phase. As such, site specific geotechnical investigation will be required during the detailed engineering design of each element/structure.

It is recommended that further geotechnical assessment could comprise investigation for depth to rock, ground water, foundation conditions including parameters, Acid Sulfate Soil (ASS) confirmatory testing and any other aspects deemed appropriate by the engaged Geotech for the proposed elements/structures.

# 7 Conclusion

CnS have undertaken a desktop geotechnical assessment for a proposed development scheme at Rafferty's Resort, Cam's Wharf NSW to accompany a planning proposal. The desktop assessment comprised review of previous geotechnical investigations at and in proximity to the site, a site inspection and review of published data. The preliminary assessment has considered several geotechnical elements at the site including the presence of groundwater, Acid Sulfate Soils (ASS) and foundation conditions with preliminary recommendations in the respective sections above.

A review of sections and discussions with the client have indicated that the proposed development scheme for the overall area has been deliberately designed to utilise the existing site profiles (where possible) to minimise excavations, Acid Sulfate Soil (ASS) disturbance, groundwater considerations and spoil management where possible. Part of this scheme has allowed the use of under croft car parking as opposed to basements for the larger structures (Sites A, C and D) with the aim to reduce groundwater and potential ASS disturbance and mitigate other measures. Other structures have been designed on-grade (where possible).

Based on the review of previous geotechnical investigations, site observations and published data review, it is considered that the site is suitable for the proposed development. There are however a range of geotechnical considerations for design of the development including groundwater, existing filling extent, vegetation removal, ASS impacts, foundations conditions and retaining walls. It is expected that many of these considerations can be suitably managed through industry standard design and construction techniques subject to additional geotechnical investigation during detailed engineering design of each individual structure/site.

The additional investigations should comprise investigation for depth to rock, ground water, foundation conditions including parameters and reactivity, retaining structures, Acid Sulfate Soil (ASS) confirmatory testing and any other aspects deemed appropriate by the engaged Geotechnical consultant for each proposed structure/site. It would also be prudent to undertake a hazardous materials assessment predemolition of existing structures.

### 8 Limitations

Cardno have performed investigation and consulting services for this project in general accordance with current professional and industry standards. The extent of testing was limited to discrete test locations and variations in ground conditions can occur between test locations that cannot be inferred or predicted.

A geotechnical consultant or qualified engineer shall provide inspections during construction to confirm assumed conditions in this assessment. If subsurface conditions encountered during construction differ from those given in this report, further advice shall be sought without delay.

Cardno, or any other reputable consultant, cannot provide unqualified warranties nor does it assume any liability for the site conditions not observed or accessible during the investigations. Site conditions may also change subsequent to the investigations and assessment due to ongoing use.

This report and associated documentation was undertaken for the specific purpose described in the report and shall not be relied on for other purposes. This report was prepared solely for the use by Iris Raffertys OperationsTrust and any reliance assumed by other parties on this report shall be at such parties own risk.

### 9 References

- [1] EJE Archtiecture, Rafferts Resort Masterplan -Revision D (Dated 2/2/22, Drawings A01 to A32), February 2022 .
- [2] Coffey Geosciences Pty Ltd, Lakeside Sector WallarahPeninsula Geotechnical Soils Investigation -Re. N07634/07-AB, 17 November 2003.
- [3] Douglas Partners Pty Ltd, Report on Geotechnical Investigation Wallarah Water and Sewer Project Wallarah Project 39017, November 2004.
- [4] Geotech Solutions Pty Ltd, Preliminary Acid Sulphate Soil Assessment Proposed Subdivision -Raffertys Resort - Cams Wharf - GS577-002/0, 12 February 2010.
- [5] Geotech Solutions Pty Ltd , Contamination Testing Proposed Subdivision, Raffertys Resort, Cams Wharf GS577-003/0, 22/02/2010.
- [6] Geotech Solutions Pty Ltd, Site Classification Report Raffertys Resort Stage 1 Cams Wharf -CGS577-004/0, October 2011.
- [7] Mecone Mosaic, "Mecone Mosaic," NSW Cadastre as of 2021-11-24 and imagery from Spatial Services NSW Dept of Finance, Services and Innovation, [Online]. Available: https://www.mecone.com.au/mosaic/. [Accessed 2022 Feb 7].
- [8] NSW Government, "Minview," 2021. [Online]. Available: https://minview.geoscience.nsw.gov.au/#/?lon=151.6148&lat=-33.12101&z=19&bm=bm1&l=ge611:n:100,ge610:n:100,ge69:n:100,ge68:n:100,ge67:n:100,ge66:n:100 ,ge65:n:100,ge64:n:100,ge63:n:100,ge62:n:100,ge61:n:100,ge612:y:100,hi1:n:25,wa1:y:100,ut1:y:50,a d0:y:100. [Accessed 7 December 2021].
- [9] NSW Government Department of Customer Service, "ePlanning Spatial Viewer," 2020. [Online]. Available: https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address. [Accessed 3 Febraury 2022].
- [10] NSW Office of Environment and Heritage, "eSPADE V2.1," NSW Office of Environment and Heritage, 2022. [Online]. Available: https://www.environment.nsw.gov.au/eSpade2WebApp#. [Accessed 3 Febraury 2022].
- [11] NSW Government, "NSW Government Historical Imagery Search and Discovery," NSW Government -Spatial Collaboration Portal, 2020. [Online]. Available: https://portal.spatial.nsw.gov.au/portal/apps/webappviewer/index.html?id=f7c215b873864d44bccddda8 075238cb.
- [12] ASSMAC, "Acid Sulfate Soil Manual, New South Wales," Acid Sulfate Soil Management Advisory Committee, August 1998.

## **Raffertys Resort**

# APPENDIX



# SITE DRAWINGS







evelopment/Drawing/81(022062 - Site Plan.dwg	APPROXIMATE SITE AREA	MURRAYS BEACH			
Raffertys D	© Cardno Limited		Drawn Date JG 4/2/22	Client Iris Rafferts OperationsTrust	
/22\062_F	This document is produced by Cardno Limited	Shaping the Future	Designed Date	Project Desktop Geotechnical Assessment	Status FOR INFORMATION ONLY
s\810\F	accordance with the terms of the retainer. Cardno	Cardno (NSW/ACT) Pty Ltd   ABN 95 001 145 035	Verified Date	Cams Wharf NSW	Project Number   Scale   Size
Project	responsibility or liability whatsoever to any third	Unit 1, 10 Denney Street	Approved	Title	81022062-001 1:1250 A3
XREF's: CAD File: N:)	party arising out of any use or reliance by third party on the content of this document.	Tel: 02 4965 4555 Fax: 02 4965 4666 Web: www.cardno.com.au	Approved	Site Plan	Drawing 1 Revision



by the second se	APPROXIMATE SITE AREA	AURRAY'S BEACH			2		
© Cardn	o Limited Reserved		Drawn Date JG 4/2/22 Checked Date	Client Iris Rafferts OperationsTrust			
This document is produced as a solely for the benefit of	iced by Cardno Limited and use by the client in	Sheping the Future	Designed Date	Project Desktop Geotechnical Assessment Raffertys resort Redevelopment	S	Status FOR INFORMATION ON	
accordance with the term	s of the retainer. Cardno Ca	ardno (NSW/ACT) Pty Ltd   ABN 95 001 145 035	Verified Date	Cams Wharf NSW	۱ ٦	Project Number Scale S	ize
responsibility or liability	whatsoever to any third	Broadmeadow, NSW 2292	Approved	Title		81022062-001 1:1250 Drawing Number	A3 Revision
party arising out of any party on the conter	use or reliance by third it of this document.	Tel: 02 4965 4555 Fax: 02 4965 4666 Web: www.cardno.com.au		Site Plan		Drawing 2	Α

## **Raffertys Resort**

# 



# PREVIOUS LOGS





CLIENT: Hunter Water Australia PROJECT: Water & Sewer Pipeline

LOCATION: Waliarah

### **PROJECT No: 39017** SURFACE LEVEL:--

**BORE No: 30** DATE: 29 Aug 04 SHEET 1 OF 1 AZIMUTH: --

**DIP OF HOLE: 90°** 

Sampling & In Situ Testing Depth **Test Results** Core Rec. % Description of Strata Type Depth (m) (m) & Comments TOPSOIL - Dark grey clayey silt with abundant organics to 01.m, moist 0.2 GRAVELLY CLAY - (Firm to stiff), light grey clayey gravel, generally comprising fine to coarse sized 0.3 Α subrounded gravel, wet, (M>>Wp) from 0.5m, (stiff), moist, (M>Wp) 0.8 Α 1.2 CONGLOMERATE - (Extremely low strength), extremely weathered, light brown conglomerate with А 1.3 some clay 1.45 TEST BORE DISCONTINUED AT 1.45m due to refusal on conglomerate bedrock ·2 X **RIG:** Backhoe **DRILLER:** Kingston Plant Hire LOGGED: Harris CASING: TYPE OF BORING: 300mm diameter solid flight auger WATER OBSERVATIONS: No free groundwater observed **REMARKS:** CHECKED **SAMPLING & IN SITU TESTING LEGEND** Point load strength is(50) MPa Standard penetration test Tube sample (x mm dia.) A B C Auger sample PL S Initials: This **Douglas Partners** Bulk sample Core drilling Ū, V 26/11/04

Date:

Geotechnics • Environment • Groundwater

Shear vane (kPa)

PP

Pocket penetrometer (kPa)

CLIENT: Hunter Water Australia

ş

13

 $\overline{}$ 

PROJECT: Water & Sewer Pipeline LOCATION: Wallarah

PROJECT No: 39017

SURFACE LEVEL:--

**DIP OF HOLE: 90°** 

BORE No: 31 DATE: 29 Aug 04 SHEET 1 OF 1 AZIMUTH: --

			Sampling	a & In Situ Testing	
(m)	Description of Strata	Type	Depth (m)	Test Results & Comments	Core Rec. %
TO roo	PSOIL - Dark grey silt with some clay, trace tlets, humid	Z			
		A,pp	0.2	300 kPa	
0.5 CL/	AY - (Stiff), light grey-brown clay with some silt and		0.45		
trac M>\	e fine sized gravel and charcoal (slope wash), Wp				
			0.8		
from com M>V	n 1m, (firm to stiff), graavelly clay generally prising fine to medium sized subangular gravel, Np, damp				
		pp	1.2	150-200 kPa	
		A	1.5		
		A	2.0		
from	2.3m, (firm), with some silty sand				
		A	2.5		
2.75 2.8 <u>SILT</u>	Y SAND - Pebbly sandstone, light brown				
on pe	bbly sandstone bedrock				
	DRILLER: Kingston Plant Like	OGGED	: Harris	CASING:	, <b>.</b>

CLIENT: Hunter Water Australia PROJECT: Water & Sewer Pipeline

LOCATION: Wallarah

### PROJECT No: 39017 SURFACE LEVEL:--

BORE No: 32 DATE: 29 Aug 04 SHEET 1 OF 1 AZIMUTH: --

# DIP OF HOLE: 90°

Depth				Sampling &	& In Situ Testing	
(m)	Description of Strata		Type	Depth (m)	Test Results & Comments	Core Rec. %
0.25-	TOPSOIL - Dark grey-brown silt with trace to some organics, moist					
0.6	CLAYEY SILT - (Loose), light grey clayey silt, wet to saturated		A	0.3		
	GRAVELLY CLAY - (Stiff), light brown gravelly clay, generally comprising fine to coarse sized subrounded gravel, M>Wp		∧,pp	0.8	250 kPa	
-1						
	from 1.5m (stiff to very stiff), dark brown mottled red, M≺Wp		A	1.5		
-2	from 1.7m, light grey-white mottled red		A	1.7		
2.4-	PEBBLY SANDSTONE / CONGLOMERATE - Brown pebbly sandstone / conglomerate		A	2.5		
2.8-	TEST BORE DISCONTINUED AT 2.8m due to refusal on peobly sandstone / conglomerate bedrock	1.0				
RIG: Ba TYPE C WATER REMAR	DRILLER: Kingston Plant Hird F BORING: 300mm diameter solid flight auger COBSERVATIONS: No free groundwater observed RKS:	e LO	GGE	D: Harris	CASING:	
A Auger B Bulks C Core d pp Pocke	SAMPLING & IN SITU TESTING LEGEND         sample       PL       Point load strength Is(50) MPa         ample       S       Standard penetration test         trilling       U,       Tube sample (x rm dia.)         t penetrometer (kPa)       V       Shear vane (kPa)	CHEC IniVals: / Date: 26/	ked Nijs 11/04		uglas Parti holes - Environment - Grou	<b>ters</b>

\_\_\_\_\_

CLIENT: Hunter Water Australia

PROJECT: Water & Sewer Pipeline

LOCATION: Wallarah

 $\pm 1$ 

PROJECT No: 39017 SURFACE LEVEL:--**DIP OF HOLE: 90°** 

BORE No: 33 DATE: 29 Aug 04 SHEET 1 OF 1 AZIMUTH: --

			P OF	HOLE: 90°	AZIMUTH:
Depth	December of the		<del></del>	Sampl	ling & In Situ Testing
(m)	Description of Strata		Type	Depth (m)	Test Results & Comments
	CLAYEY SILT - (Possible fill), dark grey clayey silt, (wet to saturated), M>>Wp from 0.3m, silty clay		A,pp	0.3	150-250 kPa
0.7	CLAY - (Stiff), light brown-grey clay with trace to some silt and with trace fine sized subrounded gravel, M>Wp		A	0.6 0.8	
-1	from 1.2m with trace to some fine to medium grained sand		A	1.2	
			A	1.5	
2	SANDY CLAY - Firm to stiff, light grey sandy clay, M>Wp			22	
2.4	CLAYEY SAND - (Loose), light brown clayey sand, saturated		A	2.3	
2.7	GRAVELLY CLAY - (Firm to stiff), grey gravely clay, generally comprising fine sized subangular gravel, M>Wp TEST BORE DISCONTINUED AT 3.0m due to				
G: Bac (PE OF ATER ( EMARK	Khoe DRILLER: Kingston Plant Hire     BORING: 300mm diameter solid flight auger     OBSERVATIONS: Seepage at 2.1m     KS:	LOG	GED:	Harris	CASING:
Auger sa Bulk sam Core drill	SAMPLING & IN SITU TESTING LEGEND Imple PL Point load strength is(50) MPa ple S Standard penetration test	CHECKE	D V		ualos Doutes

CLIENT: PROJEC LOCATI	Hunter Water Australia CT: Water & Sewer Pipeline ON: Wallarah	PI SI DI	Roje( Jrfa( P of I	CT No: 39017 CE LEVEL: HOLE: 90°	DATE: 29 SHEET 1 AZIMUTH:	Aug OF
Death				Samplir	ng & In Situ Testing	
(m)	Description of Strata		Type	Depth (m)	Test Results & Comments	
	FILLING - Dark grey gravelly silt, generally comprising fine to medium subrounded and subangular gravel	$\bigotimes$	A	0.1		
- 0.5—	TEST BORE DISCONTINUED AT 0.5m due to hand auger refusal on filling			0.3		
-1						
	·					
-2						
	1			-		
RIG: Ba TYPE O WATER REMAR	Choe DRILLER: Kingston Plant Hir F BORING: 300mm diameter solid flight auger OBSERVATIONS: No free groundwater observed KS:	e L(	DGGE	D: Harris	CASING:	

Coffey Partners International Pty. 110. WCN 003 692 619 (on al branch BH 2 engineering log -borehole VODDA 50.88-5 17 2 office 130 hs 16556/2 :1:095 ENTTERSON BALLION & FARTNERS ATH TO 17-12-95 Rois spontenced. Leocartro. No.e conclete: 17-12-56 NORDS NHAFF TO SRAKSEA SENER WATH project. langed by JEL ASE CANS WHARE NO I PORP STATION BRE C' DE birthule location. Crecked Dr. drubu model and mountants' Gente (IS? Travier -40 180 \$ Mart 1...Surface 2.1 n quie draveter \$0078 tear HI cetur. 3(1) SISTERY/ 8 Tarian Prime to 1 ā Classification Stello (is) outsit in Structure and POLITION CONTRACTOR pou. 間にしてい DOTESCO. E add...onal observations にし、北方 so, type plast(city or part cle trans/invoting pracha: **NEU** 言 THE R hears, etc. colour secondary and my/or charanerty. Ц 12.30 2222 Fill Sampy D.W. Measur plasticity. damy provinces. word life to coatse grashed, with none works? VERSION ÷. 5 W ST. UL. DIFFUE  $\overline{F_i}$ η 116 10 ş SANDY SANYELY CLAY BIGS BIASTIC 1/ SY by brance shows same time to charge showed grave. The to rectum graphes ōł 282 VSL PESTOUND 12 15 8 . 6 17 NX- 14 Gravelly Elay hand 200mm thick <u>m</u> SAND+ CLAY NUM PRATICITY WAY SEND THE 15 COMMEND AND THE 15 1.8 Vi 240 2012 -Static Water level not esteel (shed. 1 Ψ SANDY GRAYE. T DLAY higt plasticity, graw, sand (ine to Loards grained, some provisialines areas with some sollisione room fragments. 13 14 M= 24 đ 6351 12 18% P. Evers, Incerrational Poy. LASSIFICATION YMDDLS AND SOFL NETHOD. SUPPORT SAMPLES, TESTE ETH. U undisturble seaple fam. CONSISTENCY/GENSITY INCEX 1S suger screvings Not on support N TUC 44 very soft лŪ. suger or Lings H SICELET ION 005170 3 disturted serols 5 soft PENETRALION R relien/tvicere stones ifuo 32 חיין' ber'rmu ro baces 8 Vashbord Litle resistance racoing th LAD'X alow progress environmentel sample St. stift classification system cable col R standerd cenetration (est) Shi samula negovarad Shi vith pullo cone 131 Hite ynsv HÀ hap" auger HITETURE 116 н band 101 1.51 Π. nature. NATER 10 Fr tradite Ē nut reasures 3 none observed 249 sais shown by builty х 15 100 200 11 Y00'Y 10058 10150 9 STARK DI  $\nabla$ sales leve. 14 unussureteter 1905g × 枕 Dopwr I V SIT 30 dimentic genetrigheter 41 rediat const. 13 cleatic light AA water patility 10 h11 10 vater sample đ. 41 ITHE HEAT 32355 WELLER INFIDE int -1 8.5 \_leroteter 11 erry dense

R

ī.

	Co Aci	ltev 1 00	Pari 193 69	iners 2 0 19	int	ernat:	ious)	Pty.	Lto											าๆ			ΞŴ	7		00r	evoje vo			]
	е Ъ	nc Oř	11 19	1e 10	er le	in	g	100	] –																	B	H 2 m 2	o; S		
		180 100 100 100					P) NO	TTERS(	W 9817 URF TC	IDN 5 SKANS	PARINER E4 SEXE	s pty i A nain	LTD	<u> </u>						offic noie noie logge	5 100 COAMEI CORO)I D DY:	no: ncec eted	N5 17 17 JE	- 12- - 12- - 12-	95 95					!
		111 111 12 (	2002 2003 2505	) an (ar)	100. 0 120	ບກັບກຸດ	: Ge 10	nce HS Oner	R- NU 17 1rai	: 9139 er	- 51A11	UN - HI	K3 -	CR. 0F			S jooa Dear ji	nç	-90 0	CNECK: EG	ed oy.		R.1 03	<mark>لا</mark> ر . 50 د الت	riaca:	2. AH	3 s D			
C8	nethnd	1	E penetraliun	support	water	sang) tests	les. L etc	U.L.	dep(h Refres	graphir log	classification svotini	and -	50) CD)0	i) type:pla pur, second	mat Sticity ary and	eria <u>)</u> or part ainor c	icle cnar omponents	acter	120105	eojsture	CCM011LiQu	consistency/ density innex	hind	epenctro.	acler	addit	Struc Iona) d	ture and oservati	ans	
KERSION	IOV							-2	<del></del>		СН		SANDY fine with	Y GRAVELLY LO CDARSE SOME SIlts	CLAY: ni grained, tone roc	ign plas some i k fragm	ticity, g ron Stain ents	rey. ed al	Sānd 'eas,			V5r	5							 
COFBORE						7 ,7 NX=	.0 15	-	-			2	Sand	and grave)	content	increa	Sing.													
									5_															×						
¥0								-3												•										
13 31 58									-																					
/ 2/97					3	2			6 _			ci	ŌĸĠĿŎ	DHERATE: T	ne to co	arse gr	ained, gr	ey-bi	 'OKA,		-	มี			ĒW	ROCX -				-  - 
) 					Ĩ	Nx=A	0	4		000 000 000															S₽'	i hanner	`r≥fusa	l on rock		
() 1										0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0																				
									,	00000		Pe tr	netri eshei	ation becou r rock.	ning ver	y diffac	cult.													
								_ <u>-</u> 5	-	000 000 000																				
Ltd. 1989					17	NX=RO	[	<b></b>	-																SPī	hanner	refusa)	OU LOCK		
I finnel PLy.									2		- <b>-</b>	Boi	reho I szu	le BH 2 set on ro	Terr	ninated	at	7.7	) ถ											
IB) 250000 100 100 100 100 100 100 100 100 10	MET AS AD RR CT HA DT B V T e.g	: sn	au au ro ka Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca	ger ger iler snbo ole nd a atub y Su ank i bit bit	scre oril /trii re taol uger e ffix bit	COU5 3 IUÖX 4 IUÖX			i sucoo Ising ATION 4 aeasu Water Water Water	red [ ] red [ ]eve] ]eve]	a 4 cole re oging o ry Siow O none	ud SiStanc progre coserv	ce 255 760	SAMPLES U un O di BS bu E en N st: Nx SP NC SP NC SP NC SP NC SP NC SP NC SP N S val PX pri DP oyu NS val PZ oit	A TESTS disturce sturced lk samp] vironmen anoard p anoard p T sith Re Snear SSURERE basic pe ler samp szometer	E. ETC sample sample le leal sample lenetrat ie reconsolid co solid co ter netroment le	e (am) Die 10m test: vered Dne ter		CLASSI SYMBOL DESCRI DESCRI Classif MOISTU D H H H N N N	fication Fication S AND S PTION In Unifin In Unifin In Unifin In Unifin RE 	DN SOIL syste it tic 1: io 1:	init		I I I I I I I I I I I I I I I I I I I	CONSIS S S S L D D	TENCY/I sol fir scj ver fri ver Jon aed oen ver	DENSITY y soft t y styff d aole y loose se lub dens se y dense	INDEX		

	Colley Partners Incernational Pt ACN 003 692 019	ty Lto		BUEEEA	oorenoje ng
	engineering 1 borehole	0g -			BH 3 snset : c' !
	client PATT Drinciosi	ERSON BRITION ; PARTNERS PTY	LIC	nole completes: 10-0	1-37 1-97
0	project NORD porenais location: RK5	N WHARF TO SMANSEA SENER MAIN • Cri 115: 10: 15:		lagged by: JEL cnecked by:	L
	Oril sode; and mounting: Bobc Noie Diameter, 100m	iac Xounceo Aiç Is	besting 21065 - 30 Bi	EG A.L. datu	Surface 0.9 p. n. AHD
8	다. 가이미(1) 2월 10년(11) 11,10년(11) 2월 10년(11) 2월 11,10년(11) 2월 11,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 10,100(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 110(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(11) 20 100(1	N.L. depuh metres granurc log symbol jedion classi fication	Material soil type:plasticity or particle characteristics colour, secondary and minor components	anisture condition density index density index	ප්රි ප්රි additional poservations
EUSION	IOV	- SP	TOPSOIL FILL: Gravelly SAND, line to coarse grained orange-prown,	. н н	TOPSOIL FILL
COFBURE			FILL: Sandy GRAVEL, fine to coarse grained, grey-brown,		
		_0	SANDY CLAY: high plasticity, grey, sand fine to coarse grained, with some gravel.		
( 10 10 10 10 10 10 10 10 10 10 10 10 10			Grading into Sandy Gravelly CLAY grey-orange-brown. SILTY SANDY CLAY: high plasticity. light grey, sand line to coarse grained, with some fine grained, gravel.		
			- Borehole BH 3 Terminated at 3.00 m		
(C) Copyright Colley Parlners International	METHOD     S       AS     auger screwingt     S       AD     auger oriling*     S       RR     roiler/tricone     P       W     wasnopre     C       CT     cole tool     R       DT     dlatube     M       Nott snown oy suffix     X       B     blank bit       V     V bit       T     TC bit       e.g     ADT	SUPPORT III no support H aud Casino ENETRATION Tenging to Carry slow pro- IATER Inot beasures C none ous Water out!low Mater out!low	SAMPLES, TESTS, ETC CLASS U undisturbed sample [sm] SYMBU O disturbed sample DESCR Bs bulk sample based E environmental sample class gress Nx SPT + sample recovered NOIST Nx SPT + sample recovered NOIST Nx SPT + sample recovered NOIST PH pressuremeter N PH pressuremeter N NS vater sample K1 PZ oiezoneter	IFICATION LS AND SOIL IPTION on unified fication system URE dry moist wet plastic limit liquid limit	CDNSISTENCY/DENSITY INDEX VS very solt S soft F fire St stiff VSt very stiff H nard FD friable VL very losse L loose MD eedium dense D dense VD very mense

}

	Colley Partners Internation ACN 003 592 019 ENGINECTING DOPENDIE clien: principe: project.	PATTERSON BRITTON & PARTHERS PT	× 115 TN	ailice loo nc: KE nole contenere: 10 hore contenere: 10 hore contenere: 10 hore contenere: 10	Dorsnoje nc BH 4 snes: 1 c: 1 D-01-97 D-01-97
n	oprendie istation	9K5 - Cn 130m 10- 1577 800C6t Hounted Ric	2000-00-00-00-00-00-00-00-00-00-00-00-00	cneckec by De	the ,
1	note prameter	100ma:	069UJUG 210h6 -20 D		L Suriace: 1.6 m ILUA: AHD
B	Saaples, augusta in the state of the state o	R.L. R.L. Acpt.h met.cs grantint.tog systed systed	materia] Soll type:olasticity or particle characteristics colour, secondary and minor components	Registure condition consistency/ density index	ទ្ធភ្នំភ្នំ ទ្ធភ្ន «ក្នុង «ក្នុង «ក្នុង «ក្នុង «ក្នុង «ក្នុង «ក្នុង «ក្នុង «ក្នុង «ក្នុង «ក្តុង «ក្តុង «ក្តុង «ក្តុង «ក្តុង «ក្តុង «ក្តុង «ក្តុង «ក្តុង «ក្តុង «ក្តេង «ក្តេង «ក្តេង «ក្តេង «ក្តេង «ក្តេង » «ក្តេង «ក្តេង » «ក្តេង » «ក្តេង » «ក្តេង » «ក្តេង » «ក្តេង » «ក្តេង » » » » » » » » » » » » » » » » » » »
VEISION	IQV		TOPSOIL FILL: Graveliy SAND, fine to coarse grained dark grey-brown,	K	TOPSOIL FILL
	₽		FILL: Sandy GRAVEL/Bravelly SAND, fine to coarse grained, grey-brown, SANDY CLAY. high plasticity, grey-brange-brown, sand fine to coarse grained, with some fine grained, rounded gravel	- - - - - - - - - - - - - - - - - - -	FILL
			Borehole 8H 4 Terminated at 3.00 m		
Ply. LLd. 1909		z?			
national		SUPPORT	SAUDI SC TECTE STO		
(c) copyright Colley Partners Inter	AS auger screenings AQ auger drillings PR roller/tricone X washbore CI cable tool HA nand auger DI diatuue XD11 snown by suffix B blank bit Y Y bit I TC bit e g ADI	Ni) no suppor: Y sud C casing PENEIRATION Y 2 3 4	Antrico, (CS15, C10, CLASS) U undisturbed sample (am) G disturbed sample DESCRI ance E environgental sample Dased o standard penetration test: gress NX SPT + sample recovered HOISTU NC SPT with solid cone PK pressuremeter N PK pressuremeter N PK pressuremeter N PK anshear N PK pressuremeter N PK pressuremeter N PK anshear N PK pressuremeter N PK anshear N PK pressuremeter N NC SPT with solid cone D VS water sample N PK pressuremeter N NC SPT with solid cone D VS water sample N PK pressuremeter N NC SPT with solid cone D PK pressuremeter N N S SPT ST SAMPLE N N S SPT SAM	FICATION S AND SOIL PTION n unified ication system RE Ory soist vet plastic limit liquid limit	CONSISTENCY/DENSITY INDEX VS very soft S soft F ijr# St stiff VSt very stiff H naro Fb frjable VL very lodse L joose HD medium dense D mense VD very oense

	Coffey Partners International Pty Ltd ACX 003 692 019	BUG	oorenoie nc
	engineering log - borehole		BH 5 55556/2 BH 5 snee: : of :
	CILEDI PATTERSON BRITTON & PARTNERS PTY LTC DELACIDAL DEDECI NORDS WHARF TO SYANSEL SEVER HAIN OPERATION REF. CO. 2005	nole coam nale coap logged by: comerces	encec: 10-61-37 letea. 10-01-37 JEL
	orili 2002: and mounting: Bobcat Kounted Aig nole diameter: 100ms	sione: -90 DEG Dearing:	R. L. Sun face: 2.2 s Datup. AHD
	portian is samples. It is samples. I	materia) ity or particle characteristics 35 and minor components 35	structure and structure and additional observations kPa
COFBORE VEGSION	Image: Spectrum of the spectr	lly SAHO, inne to coarse grained. H	
	SAND: fine to coar shells.	e grained, light broxn, with some to coarse grained, light	
	Borehole 8H 5	Terminated at 1.20 m	
19 / 2/97			
IC) Copyright Colfey Partners Internation	IIIIIII       I       A         WETHOD       SUPPORI       SUPPORI         A5       auger drilings       Nil no subport H sud       U und         A0       auger drilings       C casing       0 dis         A7       roller/tricone       PENETRATION       as bull         W       washnore       I anging to       N sta         CT       cable tool       -anging to       N sta         HA       nano auger       WATER       very slow progress       N sta         S01       olatube       WATER       Not peasured 0 none observed       N's sta         S01       olatube       Y vit       V stat       D's van         S       blank bit       V water level       D' dyn       V's van         V       V bit       -       water out/low       N's water         e.g       AOT       AOT       Water inflow       P2       pie	TESTS, ETC       CLASSIFICATION         sturbed sample (mo)       STMBOLS AND SO         urbed sample       DESCRIPTION         sample       DESCRIPTION         sample classification s       Descentration so         dard penetration test:       + Sample recovered         + sample recovered       MOISTURE         with solid cone       0       dry         shear       H       moist         sinc penetrometer       X       wet         mic penetrometer       Xo       plast         yill liquit       Dester       Digut	Image: Second

	Cottev ACN 00:	Partner 692 01	s Inti S	enationaj	D <sub>CT</sub>	Lic						וחה	[·······
	900	ino	مە	າມດ	• loc	1_				GU			BH 6
(_) (^)	bor	eno	16	IIIG .	100	}						1/5556/2	5 <b>7821 ( C' )</b>
	Drinc;	0 <b>ð</b> .		PK NM	TERS(	IN BRITTON	5 P&P	TNERS PTY	Y LTC	noie com noie com	mencec piereo.	10-01-97 10-01-97	·
	Dousi	1003	1000. 11. 11. 11. 11. 11. 11. 11. 11. 11. 11	RK:	ij - Ci	3850 - 3850		DEACH MAIN	[fi	lagged o Checked I	y: Dy.	age	
	naie a	19061 01 1906165		100 100	ilan Ian	i	<del></del>		slooe: -90 ik eearing:	50 	·	S.L.Surf datum	ace: 1.3 c AHD
) 88	(kiik) 1	L perctration	kaler	Sampies, tests, etc	- H (	dep(h metres	graphic tog	c]assjfjcation Symbo]	materia] soli type:olasticity or particle characteristics colour, secondary and minor components	mojsture condition	consistency/ density index	an sand an sand an echenetro- meter	structure and additiona} observations
COFEMANE VENSION	10V	RIU.			-1			SP	Fill. Gravelly SAMO, fine to coarse grained, dark grey.	H		2285	FILL
1.32 K01			⊻		_0	- ctatestationstatest		- <del>CH</del>	SANDY GRAVELLY CLAY. high plasticity, grey-orange-brown, sand fine to coarse grained, gravel fine grained,	- * <del>X</del> >Xp	- vst		
19 / 2/9 13 3					1				Coarse grained, With some gravel, grading into Sandy Gravelly CLAY		sc		- - - - - - - - - - - - - - - - - - -
apht Calley Partners International Pty. Ltd. 1909	METHOD AS AO PR X CT HA CT HA CT HA CT HA CT HA CT HA CT HA CT HA CT HA CT HA CT HO CT HA CT HO CT HO C HA CT HO C HO C HA C HO C HO C HO C HO C HO C	auger auger rolle hand glatu glatu glatu	Scree drill r/tric core tool auger be wffix olt	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 UPPOR i) m ENET I ATER 00	2 	cititititititititititititititititititit	E resista no to slow progr none goser	Borehole SH 6 Terminated at 3.00 m SAMPLES, TESTS, ETC U undisturbed sample (aa) 0 disturbed sample BS oulk sample E senvironmental sample F schward genetration test: N standard g	FICATION S AND SOI PTION In unstied ication sy RE dry gaist	L	CO VS S St VSt F VSt VSt	NSISTENCY/DENSITY INDEX very soft soft inm stiff very stiff hard friable very loose
(C) Capyr	Y 1 e. <u>q</u>	V OIL TC DI ADT	t	Ē	₩₩₩	water out water inf	f lox lox		DP DURBELER N DP DURBELE penetrometer No NS water sample NJ PZ piezometer NJ	xet plastic liquid	lini <u>:</u> Junit	L MD D YC	loose Wedium Dense Dense Very Dense

]

											TESTBO	ORE LOG				_		_	
			: :	Steve	ens Hold	lings Pty cid Sulr	/. Ltd.	essm	nent							F	PIT N ILE / J	<b>O</b> : OBNO:G	<b>TB 001</b> SS 577
	LOCA		N : F	Raffe	rty's Res	sort		65301								S	HEET	: 1 OF 1	
╞		PME EX(	NI I CAVA		: Kobe	lco 5t E	xcavator					LOGGED BY	00mm spiral flig : GM/ZO	ghted au	ger		С	HECKED	BY :
ľ	POSI	TION	l : F	or loc	cation of	test bo	res see D	Drawir	ng 1										
┢	z		DF	HLLIN H	NG ⊗ທ		ł	z				MA	TERIAL		<u>≻</u>		ó		
	VE E PENETRATIO	ιI	SUPPORT	GROUND WATE LEVELS	SAMPLES	DEPTH (m	GRAPHIC LOG	SYMBOL	S	oil Ty	MATERIAL pe, Colour, Plasti Secondary and	DESCRIPTION city or Particle Chara Minor Components	cteristic	MOISTURE	CONSISTENC RELATIVE	100 HAND	300 B METER 400	s & Oth	STRUCTURE her Observations
					D 0.10m		<u>11, 11, 11</u>		TOPSOIL fine to me rootlets	L, Sai ediun	ndy Gravelly Claye n sub rounded to r	ey SILT, stiff to hard, s ound gravel, fine grain	slightly moist, brow ned sand, contains	vn, s D to №	A St to VSt			Well gras DCP @ 5 5, 13, 32 7/50mm, 18, 18, 3 4/50mm,	ssed @ Surface Surface , 18/100mm, , 15, 15, 15, 0, 25/100mm, , 10, 10, 7, 5,
					0.50m	- 0.5-		0	Sandy Cl coarse su	layey ub roı	Gravelly SILT, ha unded to round gr	rd, slightly moist, grey avel, fine grained sand	brown, fine to	D to M	ин			8, 7, 14,	14, 9, 8, 8, 6
					0.60m				Sandy Gi rounded	ravell grave	y Silty CLAY, harc	I, slightly moist to moi: ly	st, brown, fine sub	,					
				er Water	1.00m D 1.10m	- 1.0								м	Н				
>> 09/02/2010 14:34 8.2.00				Drilled Ove	1.50m D 1.60m	- 1.5 - - ·		1	.50m Gravelly 3 rounded 9 .80m Gravelly 3 gravel	Sand grave	y CLAY, very stiff, al	moist to very moist, b noist to wet, grey brow	prown, fine sub /n, fine sub rounde	M to V	v vst				
AS_WHARF.GPJ < <drawingfile< td=""><td></td><td></td><td></td><td>•</td><td>2.00m D-E022 2.10m</td><td> 2.0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></drawingfile<>				•	2.00m D-E022 2.10m	2.0													
ERTYS_RESORT_CAN				Water inflow @ 2.4m	2.50m D 2.60m									W	D				-
LOG GS_577_RAFFL					3.00m D 3.10m	3.0-		3	.10m										
TESTBORE									Testbore Target c	depth	uu1 Terminated at	3.10 m							
UTIONS																			
ECHSOL		PH NC	OTOG TES	RAPHS	s	→ 3.5 ] YES		Þ	NO NO						1			1	
SOLUTIONS_00 LIBRARY.GLB Log GEOTE	MET N BH R SUP T	HOD Natu Exist Back Bulld Ripp PORT	ral Ex ing Ex hoe B lozer f er er	posure cavati sucket Blade	e ion N		No Level on Da vater inflow vater outflo	Resist ate sho v w	tance own	S L E M H V	SAMPLES & FIEL J50 - Undistur 50 mm d 0 - Disturbe 3 - Bulk Disi MC - Moisture HP - Hand Pe /S - Vane Sh R-Remo PBT - Plate Be	D TESTS bed Sample iameter d Sample urbed Sample Content netrometer (UCS kPa ear; P-Peak, uded (uncorrected kF aring Test	a) CLASSIFIC Ba: Class D - Dr M - Mc W - Wo	CATION S DESCRIF sed on Un sification S RE y pist et	YMBOL PTION ified ystem	LS &	CC RE VS S F St VS H VL L MI D VI	DNSISTENC ELATIVE DE S St - D	SY/ ENSITY - Very Soft - Soft - Firm - Stiff - Very Stiff - Hard - Very Loose - Loose - Medium Dense - Dense - Very Dense
EOTECH	See E details & bas	xplar s of a is of (	hatory bbre\ descr	VNote Viatior iption	es for ns s.				GEO	TE	CH SOL	UTIONS F	TY LTD						

ſ

٦

											TEST	BORE LOG	3						
		IT FCT	: 5	Steve Prelin	ens Hold	lings Pty	. Ltd. hate Δs	Seco	ment								PI FIL	I NC	<b>D</b> : <b>TB 002</b> DB NO : GS 577
	LOCA	TION	: F	Raffe	rty's Res	sort	nate / te	00001	nont								SH	IEET	: 1 OF 1
	EQUIF				: Kobe	lco 5t Ex	xcavato	r				METHOD :	300mi	m spiral flig	hted aug	ger			
	POSIT		: F	or loc	ation of	test bor	es see	Drawi	ing 1			LOGGED BI	r . Gr	VI/20				Gr	IECKED B1 .
Ī			DR		IG				Ū			I	MATE	RIAL					-
	VE E PENETRATION	. т	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL		So	MATER bil Type, Colour, P Secondary	IAL DESCRIPTION lasticity or Particle Cha and Minor Component	aracteris ts	stic	MOISTURE	CONSISTENCY RELATIVE DENSITY	100 200 A HAND 200 A PENETRO-	300 b METER	STRUCTURE & Other Observations
					0.10m D-E020 D-QA01 0.20m		<u>x 12</u> <u>x</u> 1 <u>7</u> <u>x 17</u> x 17 x		1 S	TOPSOIL slightly mo contains r	., Sandy Clayey SII oist, brown, fine su ootlets	LT with trace Gravel, st b round to rounded gra	tiff to ver avel, fine	ry stiff, dry to e grained sand	, D to N	St to VSt			Well grassed @ Surface DCP @ Surface 6, 3/100mm, R
					0.50m D-E023 0.60m	- 0.5			0.25m 5 0.70m 5	Sandy Gra coarse su Silty Grav	avelly Silty CLAY, b round to rounded	dry to slightly moist, gr d gravel, fine grained s gravel, fine grained s	ey browr and e to meo	n, fine to dium sub	D to N				
					1.00m D 1.10m				1.20m	rounded g	gravel, medium pla	sticity	grey mot	ttled orange	м	н			DCP @ 0.75m 17, 15, 10/100mm, - 15/50mm, 13/30mm, R - - -
2010 14:34 8.2.004				Drilled Over Water	1.50m D-E024 1.60m	- - - 1.5 - -			ł	prowń, fin	e to medium sub r	ounded gravel	5 5	5					-
<pre>MHARF.GPJ &lt;<drawingfile>&gt; 09/02/</drawingfile></pre>					2.00m D 2.10m	- 2.0									M to V	/ VSt to H			DCP @ 1.8m 16, 10, 16, 16, R - - - -
7_RAFFERTYS_RESORT_CAMS_					2.50m D 2.60m	- 2.5			2.90m										-
GS_57				g 2.9m	3.00m	3.0-			( r	Gravelly C medium p	CLAY, moist to wet lasticity	, grey, fine to medium s	sub rour	nded gravel,	w				
LOG	+++	$\parallel$		annow €	3.10m		V#]_}/		3.10m	Taethora	TR 002 Torminat	1 at 3 10 m			_				
ONS_TESTBORE				Water ir		-			I	Target d	epth	a at 3, 10 11							-
SOLUTI						3.5-													
TECHS		PHO NO	DTOG TES	RAPHS		YES				10									
SOLUTIONS_00 LIBRARY.GLB Log GEO	METH E BH R SUPF T	HOD Natur Existir Backh Bulldo Rippe PORT Timbe	al Exp ng Ex noe B ozer E r ering	oosure cavati ucket Blade	e ion V		TION	o Resis Date sh w ow	stance		SAMPLES & F U50 - Undi 50 m D - Distu B - Bulk MC - Mois HP - Hand VS - Vane R-Re PBT - Plate	FIELD TESTS sturbed Sample m diameter irbed Sample Disturbed Sample ture Content d Penetrometer (UCS I e Shear, P-Peak, emouded (uncorrected e Bearing Test	kPa) I kPa)	CLASSIFIC, SOLL I Base Classif MOISTURE D - Dry M - Mois W - Wet	ATION SY DESCRIP ed on Unit ication Sy E	<b>MBOL</b> TION fied /stem	S &	CO REI VS F St VSt H VL L MD D VD	NSISTENCY/ LATIVE DENSITY - Very Soft - Soft - Firm - Stiff t - Very Stiff - Hard - Very Loose - Loose - Medium Dense - Dense - Very Dense
SEOTECH_S	See Ex details & basis	xplan of ab s of d	atory brev escr	Note viatior iption	es for ns s.				G	EOT	FECH SC	LUTIONS	ΡΤ	Y LTD					



LOG GS\_577\_RAFFERTYS\_RESORT\_CAMS\_WHARF.GPJ <<DrawingFile>> 09/02/2010 14:34 8.2.004 TESTBORE GEOTECHSOLUTIONS SOLUTIONS 00 LIBRARY.GLB Log

									TESTBORE	LOG						
CLIE PRO	NT JEC	: T:	Steve Prelim	ns Holdi ninary Ac	ngs Pty d Sulp	/. Ltd. hate As	sess	ment						FIL	E/JC	D : IB 004 DB NO : GS 577
LOC	ATIO	N :	Raffe	ty's Res	ort									S⊦	IEET	: 1 OF 1
DAT	E EX		ATED	: Kobel : 22/01/	CO 51 E	xcavato	r		LOG	GGED BY : G	nm spiral filghte GM/ZO	a aug	jer		CH	ECKED BY :
POS	ITIO	N : I	For loc	ation of	test bor	res see	Draw	ing 1								
	7	D	RILLIN ≝	IG مرید			z			MATE	RIAL		≻		)	
VE E DENETRATION		SUPPORT	GROUND WATE LEVELS	SAMPLES 8 FIELD TEST	DEPTH (m)	GRAPHIC LOG	CLASSIFICATIC SYMBOL	Sc	MATERIAL DESCI bil Type, Colour, Plasticity or F Secondary and Minor (	RIPTION Particle Characteri Components	istic	MOISTURE	CONSISTENC RELATIVE DENSITY	100 200 E HAND 200 E DENETRO	300 B METER	STRUCTURE & Other Observations
				ES-E01 0.10m	0.0-		_	0.05m TOPSOIL fine to me	., Sandy Clayey SILT with Graved um sub rounded to round gr	/el, hard, slightly r avel, fine grained	noist, brown, sand, contains  /	D to M	н			Well grassed @ Surface DCP @ Surface
					-			\minor roo Sandy Gr orange br sand, me	tlets ravelly Silty CLAY, hard, dry to rown, fine to coarse sub round dium plasticity	slightly moist, bro ed gravel, fine to r	wn mottled medium grained					15/100mm, 15/50mm, R -
				0.50m ES-E02 0.60m	- 0.5			Increase	in Sand and Gravel content @	0.5m		D to M	н			
					-			0.80m	AV alightly point to point are	w mottled eronge	brown fino					-
				1.00m	- 1.0-			grained s	and	y motiled orange	brown, nne	м			     	-
				1.10m			-	1.10m Testbore	TB 004 Terminated at 1.10 m							
					-	-		Target d	lepth							-
					1.5-											
					-	-										-
					2.0-											-
					-	-										-
					-											-
					2.5-											-
					-	-										-
					3.0-											-
					-	-										-
					-											-
	PI	ното	GRAPHS	,	3.5											
	N	OTES			YES		[	NO NO	I				MROLO	2		
ME N BH R <b>SUI</b> T	THOD Natu Exis Bac Bulle Ripp <b>POR</b> Timl	ural E sting E khoe dozer per <b>T</b> bering	xposure Excavati Bucket Blade	on V		LEVEL ON E vater inflo	o Res Date si w	istance hown	SAMPLES & FIELD TEST U50 - Undisturbed Sat 50 mm diameter D - Disturbed Samp B - Bulk Disturbed S MC - Moisture Conter HP - Hand Penetrom VS - Vane Shear; P-I R-Remouded (u PBT - Plate Rearing Tc	r <b>S</b> mple le Sample tt eter (UCS kPa) Peak, ncorrected kPa) est	CLASSIFICATI SOIL DE: Based Classifica MOISTURE D - Dry M - Moist W - Wet	ION SY SCRIP on Unif tion Sy	TION FION ied rstem	5 & 	CORE VS S F St VS H VL L D D	INSISTENCY/ LATIVE DENSITY - Very Soft - Soft - Firm - Stiff t - Very Stiff - Hard - Very Loose - Loose Dense - Dense - Dense
See l detai & bas	Expla ls of a sis of	inato abbre desc	ry Note viatior	es for Is s.	<b>_</b>			GEOT	IECH SOLUTI	ONS PT	Y LTD					,

									TESTBO	ORE LOG						
CLIE PRO		: T ·	Steve Prelin	ns Holdi Jinary Ac	ngs Pty d Sulr	y. Ltd. bhate As		ment						PI FIL	T NC .e / JC	<b>D</b> : <b>TB 005</b> DB NO : GS 577
LOC	ATIO	N :	Raffe	ty's Res	ort			ment						SH	IEET	: 1 OF 1
DATE		EN I		: Kobel	co 5t E /10	xcavato	or			LOGGED BY : 0	mm spiral flighte GM/ZO	ed aug	ger		CH	ECKED BY :
POS	TIOI	N : F	or loc	ation of	test bo	res see	Draw	ing 1								
z		DF		IG ഹഗ			z			MATE	ERIAL		≿.	ć	þ	
VE E penetration	ц. <u>т</u>	SUPPORT	GROUND WATE LEVELS	SAMPLES &	DEPTH (m)	GRAPHIC LOG	CLASSIFICATIC SYMBOL	So	MATERIAL bil Type, Colour, Plasti Secondary and	DESCRIPTION city or Particle Character Minor Components	ristic	MOISTURE CONDITION	CONSISTENC RELATIVE DENSITY	100 200 AAND 200 APNETRO	300 m METER 400	STRUCTURE & Other Observations
				0.10m				0.07m TOPSOIL medium s	., Sandy Clayey SILT w sub rounded to round g	rith Gravel, hard, dry, bro ravel, fine grained sand,	own, fine to contains minor	D to M	VSt			Well grassed @ Surface DCP @ Surface
				ES-E04 0.20m 0.50m ES-E05 & E05DP 0.60m	- 0.5			Vrootiets Sandy Sil sub round	lty Gravelly CLAY, hard Jed gravel, medium pla	l, slightly moist, brown, fii sticity	/	м	н			6, 15, 24, 22/100mm, 15/50mm, R - - - - - - - -
				1.00m				0.95m Sandy Cl	AY with Gravel slightly	v moist mottled orange a	and grey fine to					-
				ES-E06 1.10m	- 1.0-			medium s	sub rounded gravel, fine	e to medium grained san	d	м				
			Fable					Testbore Target d	TB 005 Terminated at lepth	1.10 m						
<u> </u>	N	OTES			YES			NO NO					MPOLO	201		
MET N BH B R SUF T	ETHOD       PENETRATION       SAMPLES & FIELD TESTS       SOIL DESCRIPTION       RELATIVE DENSITY         Natural Exposure       www.rfs       www.rfs       U50 - Undisturbed Sample       Soil DESCRIPTION       Based on Unified       VS       - Very Soft         4 Backhoe Bucket       Bulldozer Blade       Ripper       WATER       D       D isturbed Sample       MOISTURE       VSt       - Very Soft         PPORT       Level on Date shown       VS       - Vany Soft       St       - Stiff         Timbering       Level on Date shown       VS       - Vany Shear; P-Peak,       Moist       L       - Loose         PBT       PBT       Plate Bearing Test       PBT       Plate Bearing Test       W       Wet       MD       - Medium Dense         Explanatory Notes for       F       PEN       Plate Bearing Test       VS       - Very Dense															
detail & bas	s of a sis of	abbre desc	viation	IS S.				GEO	FECH SOL	UTIONS PT	Y LTD					

GEOTECH SOLUTIONS 00.LBRARY.GLB Log GEOTECHSOLUTIONS TESTBORE LOG GS 577 RAFFERTYS RESORT CAMS WHARF.GPJ <-CDrawingFile>> 09022010 14:34 32.004

									TESTE	BORE LOG						
CLIEI PRO	NT IECT	: S : F	Steve Prelim	ns Holdir iinary Ac	ngs Pty id Sulp	/. Ltd. hate As	sessr	nent						FIL		D : IB 006 DB NO : GS 577
		א: F אד די	Raffer YPF	ty's Reso · Kobelo	ort	xcavato	r			METHOD 300	mm spiral flighte	ed au	ner	SF	1EE I	: 1 OF 1
DATE	EXC	AVA	TED	: 22/01/	10	Xouvate				LOGGED BY : 0	GM/ZO	ou uu	301		CH	HECKED BY :
POSI	TION	: Fo	or loc	ation of t	test bor	res see	Drawi	ng 1								
z		DR	ILLIN ≝	G ഹഗ			z			MAT	ERIAL		۲	Ċ	5	Ι
VE E PENETRATIO	гI	SUPPORT	GROUND WATE LEVELS	SAMPLES	DEPTH (m	GRAPHIC LOG	CLASSIFICATIC SYMBOL	So	MATERI/ hil Type, Colour, Pla Secondary a	AL DESCRIPTION sticity or Particle Characte nd Minor Components	eristic	MOISTURE	CONSISTENC RELATIVE DENSITY	100 200 × DENETR	300 B METER 400	STRUCTURE & Other Observations
				0.10m ES-E07 0.20m	- 0.0	<u>11. 11. 11.</u> 12. <u>11.</u> 1. 11. 11.		TOPSOIL moist, bro sand, con	, Sandy Sandy Grav wn, fine to coarse s tains rootlets	velly CLAY, very stiff to har ub rounded to round grave	d, dry to slightly I, fine grained	D to N	VSt to H			Well grassed @ Surface DCP @ Surface 9, 14, 20, 18, 14, 15, 16, 20, 30, 35
				0.50m FS-F08	- 0.5-			Sandy Sill fine to me	ty Gravelly CLAY, h dium sub rounded o	ard, slightly moist, brown to ravel	o orange brown,					- -
				0.60m								м	н			
				1.00m ES-E09 1.10m	- 1.0-			1.00m Sandy CL brown/wh	AY with Gravel, har ite/grey, fine sub rou	d, slightly moist, orange bro unded gravel	own speckled	м	н			-
					-	<i>¥1111</i>		Testbore Target d	TB 006 Terminated epth	at 1.20 m						
					- 1.5											-
					-											-
					-	-										
					2.0-											-
					-											
					2.5-											-
					-										     	
					-											
					3.0-											-
					-											
					- 2 F										 	· · ·
	PHO NO	DTOGI TES	RAPHS		- 3.5 YES	-		NO NO				-				
METHOD       PENETRATION       SAMPLES & FIELD TESTS       CONSISTENCY/         N       Natural Exposure       Samples & FIELD TESTS       Soil Description       Based on Unlifed       VS       Very Soft         B       Existing Excavation       B       Based on Unlifed       S       Soil Description       VS       Very Soft         B       Buildozer Blade       No Resistance       D       Disturbed Sample       D       Classification System       St       Soil Description         WATER       Water       Level on Date shown       WC       Moisture Content       HP       Hand Penetrometer (UCS kPa)       M       M       Noist       VL       - Very Loose         SupPort       T       Timbering       Water outflow       PBT       Plate Bearing Test       PBT       Plate Bearing Test       W       Wet       MD       Medium De									DNSISTENCY/ LATIVE DENSITY - Soft - Firm - Stiff - Hard - Very Losse - Losse - Medium Dense - Dense - Very Dense							
See E details & bas	xplan s of at is of d	atory obrev lescri	Note iation ptions	s for s s.				GEOT	ECH SO	LUTIONS PT	Y LTD					

GEOTECH\_SOLUTIONS\_00 LIBRARY GLB Log GEOTECHSOLUTIONS\_TESTBORE\_LOG GS\_577 RAFFERTYS\_RESORT\_CAMS\_WHARF GPJ <<Drawingrille>>> 09/02/2010 14:34 3.2.004

ſ

٦

			o.		5				TES	TBORE L	OG				P		O · TB 007
CLIE PRO	NT JEC1 ATIO	: Г: N:	Steve Prelim Raffer	ns Holdii ninary Ac tv's Reso	ngs Pty id Sulp ort	y. Ltd. phate As	ssessr	nent							FII SH	LE / JO HEET	DB NO : GS 577 : 1 OF 1
EQU	IPME	NT 1	YPE	: Kobel	co 5t E	xcavato	or			METHO	D : 300n	nm spiral flight	ed au	ger			
DATE POSI		CAV/ N : F	ATED	: 22/01/ ation of t	10 est bo	res see	Drawi	ng 1		LOGGE	DBY:G	GM/ZO				CH	HECKED BY :
		DF	RILLIN	IG مریع			z				MATE	ERIAL		<u>ک</u>		5	
VE E PENETRATION	LΙ	SUPPORT	GROUND WATE LEVELS	SAMPLES 8 FIELD TEST	DEPTH (m)	GRAPHIC LOG	CLASSIFICATIO SYMBOL	S	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components					CONSISTENC RELATIVE DENSITY	100 200 × HAND	300 B METER	STRUCTURE & Other Observations
				ES-E10 0.05m 0.20m ES-E11 &			X X X X X X X X X X X X X X X X X X X	0.05m FILL, Sar FILL, CL/	ndy Silty Gravell AY with Gravel,	ly CLAY, dry to sligh dry to slightly moist,	tly moist, bro brown	own	D to N	л			Well grassed @ Surface DCP @ Surface 10, 8, 14, 14
				E11DP 0.30m	+		×	0.30m Testbore	TB 007 Termin	ated at 0.30 m							
								Target o	lepth								
					3.5-												
	PH NC		RAPHS	·	YES												
MET N BH B R SUP T	HOD Natu Exis Bacl Bullo Ripp POR Timb	ural Ex ting E khoe I dozer ber <b>F</b> bering	posure kcavati Bucket Blade	on W		ATION T Level on I vater inflow vater outf	o Resis Date sh w low	own	SAMPLES           U50         -         U           5         -         -         D           B         -         B         -         B           MC         -         M         HP         -         H           VS         -         V         R         R         PBT         -         P	& FIELD TESTS Indisturbed Sample of mm diameter isturbed Sample ulk Disturbed Sample ulk Disturbed Sample loisture Content and Penetrometer ane Shear; P-Peak -Remouded (uncor late Bearing Test	ile (UCS kPa) rected kPa)	CLASSIFICAT SOIL DE Based Classific MOISTURE D - Dry M - Moist W - Wet	CION SY SCRIP on Uni ation Sy	YMBOLS TION fied ystem	5&	CRE VS F StS VS VL L D VD	DNSISTENCY/ LATIVE DENSITY - Very Soft - Soft - Firm - Stiff - Hard - Very Loose - Loose - Loose Dense Dense - Very Dense
detail & bas	xpla s of a is of	nator abbre desc	viation ription	es tor IS S.				GEO	TECH S	OLUTIO	NS PT	Y LTD					

GEOTECH SOLUTIONS 00 LIBRARY.GLB Log GEOTECHSOLUTIONS TESTBORE LOG GS 577 RAFFERTYS RESORT CAMS WHARF.GPJ <<- rtransmitterile>> 09/02/2010 14:34 8.2.004

CLIE	ENT : Ste	evens	Holdings I	Pty. Ltd.	TESTP	IT LOG				Н	OLE NO : TP 101
PRC LOC	JECT : ATION :	Site C Raffe	lassificatio erty's Reso	n rt						PI SH	ROJECT REF: GS 577 HEET: 1 OF 1
EQU	IPMENT	TYPE	: 5t Exca	avator		METHOD : 400	mm bu	cket			
DAT LOC	E EXCA\ ATION:	ATED/ See I	D : 22/09/1 Drawing fo	1 r location		LOGGED BY : (	GM			CHECK	ED BY :
							1	T			
GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG CLASSIFICATION	G MATE Soil Type, colour, Rock Τ β Secondar	RIAL DESCRIPTION plasticity or particle charac ype, colour, grain size y and minor components	steristic	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DCP (BLOW COUNT)	100 HAND 200 PENETRO- 300 METER 400 (KPa)	STRUCTURE & Other Observations
		0.0		FILL -TOPSOIL,Sandy Cla with trace of fine to mediur	yey SILT, dark brown/ blacl n grained subrounded to ro	x, fine grained sand, unded gravel,	D	St	4		
		-		FILL- Sandy CLAY, mediu sand, trace of fine to medi	m plasticity, brown, fine to n um grained rounded to subr	nedium grained ounded gravel			1		
	0.50m U50	0.5 —							2		-
		-					M to W	F to St			
,ed		-							1		
Not Observ		-							4		
	1.00m	1.0 —		1.00m FILL- Gravelly Sand , fine :	e to coarse, grey, moist (Bottom ASH)				11		
									10		
2		-					М	St to VSt			
1		1.5		1.50m Gravelly Sandy CLAY, mer medium subrounded to rou	dium plasticity, grey mottled unded gravel, fine to mediur	l brown, fine to n grained sand	м	St to VSt	-		
			-	Testpit TP 101 terminated	at 1.70 m						
W D M V O I PL	ATER / MO - Dry - Mois - Wet MC - Opti - Plas - Wat	ISTUR st mum M tic Limi er inflov	E SA U D ES C B t SP W HF	MPLES & FIELD TESTS - Undisturbed Sample - Disturbed Sample - Environmental sample - Bulk Disturbed Sample T - Standard Penetration Test - Hand/Pocket Penetrometer	CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	RELATIVE DENS VL - Very Loos L - Loose MD - Medium D D - Dense VD - Very Dens	<b>SITY</b> se Dense se	RO EL VL M H H H EH	CK ST - Ex - Ve - Lo - Me - Hiu - Ve - Ex	RENGTH tremely low ary low w edium gh ary high tremely high	ROCK WEATHERING         RS       - Residual soil         XW       - Extremely weathered         DW       - Distinctly weathered         SW       - Slightly weathered         SW       - Slightly weathered         FR       - Fresh rock
See deta & ba	Explanato ils of abbr sis of des	ory No eviatic criptio	tes for ons ns.	GEC	DTECH SOLU	JTIONS PT	Y L	ΓD			

CLIENT : St PROJECT :	evens Site C	Holding Classifica	s Pty tion	. Ltd.	ILGIF						HO PR	DLE NO: TP 102 OJECT REF: GS 577
LOCATION :	Raffe	erty's Re	sort	tor			marral	akst			SHE	EET : 1 OF 1
EQUIPMENT		: : 5t E	cava	ltor				cket		СН	FCKE	
LOCATION :	See I	Drawing	for lo	ocation		LOGGED BT .	Givi			CI	LORL	
		1	_				1	-	~		-	
GROUND WATER LEVELS SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATI Soil Type, colour, Rock Seconda	ERIAL DESCRIPTION , plasticity or particle charac Type, colour, grain size ry and minor components	steristic	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	100 HAND 200 PENETRO- 300 METER (kPa)	400	STRUCTURE & Other Observations
	- 0.0	र के के कि की इंग्रे के कि त के कि की के कि कि की है के के कि		TOPSOIL, Sandy Clayey of fine to medium subrour	SILT, dark brown/ black, fine ided to rounded gravel	e grained sand, trace	D	F	2			
				Gravelly Sandy CLAY, me medium grained sand, tra- gravel	Gravelly Sandy CLAY, medium plasticity, grey mottled brown, fine to medium grained sand, trace of fine to medium subrounded to rounded gravel				4			
	0.5 —			0.50m Gravelly SAND, fine to me	edium grained sand, grey, fir	ne to medium			10			
pava	-			subrounded to rounded gr	ravel		м	VSt to H	15			
Not Obs	-			Sandy CLAY, medium pla grained sand, with fine to	grained sand, with fine to medium subrounded to rounded gravel							
1.00m U50	1.0						м	St to VSt	7			
									8			
1.50m	- 1.5			1.50m Testpit TP 102 terminated	at 1.50 m							
	-	-										
		-										
<u> </u>	2.0 -	I					I	I			<u>   </u>	
WATER / MC D - Dry M - Mois W - Wel OMC - Opti PL - Plas	DISTURI st t imum M stic Limit ter inflov	E IC t	SAMP D ES B SPT HP	LES & FIELD TESTS     Undisturbed Sample     Disturbed Sample     Environmental sample     Bulk Disturbed Sample     Standard Penetration Test     Hand/Pocket Penetrometer	CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	RELATIVE DENS VL - Very Loos L - Loose MD - Medium [ D - Dense VD - Very Den	SITY se Dense se	RO EL SL L M H H EH	CK ST - Ex - Ve - Lo - Me - Hi - Ve - Ex	RENGTH ary low w edium gh ery high ary high	v	ROCK WEATHERING         RS       - Residual soil         XW       - Extremely weath         DW       - Distinctly weather         SW       - Slightly weather         FR       - Fresh rock
ee Explanate etails of abbi basis of des	ory Not reviatio	tes for ons ns.		GEO	- DTECH SOLU	JTIONS PT	Y L	ΓD				

CLIENT : Stevens Holdings Pty. Ltd.
PROJECT : Site Classification

METHOD: 400 mm bucket

LOGGED BY : GM

HOLE NO : TP 103 PROJECT REF : GS 577 SHEET : 1 OF 1

CHECKED BY :

LOCATION : Rafferty's Resort EQUIPMENT TYPE : 5t Excavator

ROTECH

DATE EXCAVATED : 22/09/11

LOCATION : See Drawing for location



200				1011	Joalon								
GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATEf Soil Type, colour, p Rock Ty Secondary	RIAL DESCRIPTION plasticity or particle charact ype, colour, grain size y and minor components	eristic	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	(BLOW COUNT)	00 HAND 00 PENETRO- 00 METER	00 (kPa)	STRUCTURE & Other Observations
-		0.0-	र रेप रंग र रेप रंग रंग र रंग रंग र रंग रंग रंग रंग रंग रंग र रंग रंग रंग रंग		TOPSOIL, Sandy Clayey Sl of fine to medium grained s 0.15m	ILT, dark brown/ black, fine ubrounded to rouded grave	grained sand, trace I	D	St	4			
		-			Garvelly SAND, fine to med subrounded to rounded gra	lium grained sand, dark bro vel	wn, fine to medium			6			
		-						D	St to VSt	5			
		0.5 —			0.50m Gravelly Sandy CLAY, med medium grained sand, fine i gravel	ium plasticity, mottled grey to medium graioned subrou	brown, fine to Inded to rounded			5			
Not Observed		-								10			
		-								12			
		1.0-						м	VSt	9			
		-											
		- 1.5 —			1.50m Testnit TP 104 terminated a	at 1.50 m							
		-											
		-											
		2.0 —	I										
M M W OI PL	ATER / MO - Dry - Mois - Wet MC - Optin - Plas - Wat	ISTURE tt mum M tic Limit er inflov	E C V	SAMF U D ES B SPT HP	PLES & FIELD TESTS - Undisturbed Sample - Disturbed Sample - Environmental sample - Bulk Disturbed Sample - Standard Penetration Test - Hand/Pocket Penetrometer	CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	RELATIVE DENS VL - Very Loos L - Loose MD - Medium D D - Dense VD - Very Dens	SITY Se Vense Se	RO EL VL M H VH EH	CK ST - E> - Ve - Lo - Me - Hi - Hi - Ve - E>	TRENGT Atremely ery low we edium gh ery high Atremely	<b>H</b> low high	ROCK WEATHERING         RS       - Residual soil         XW       - Extremely weathered         DW       - Distinctly weathered         SW       - Slightly weathered         FR       - Fresh rock
See deta & ba	Explanato ils of abbr sis of des	ory Not eviatio criptior	es for ns ns.		GEO	TECH SOLL	ITIONS PT	YL	TD				
											Fil	e: G	S 577 TP 104 Page 1 OF

METHOD : 400 mm bucket

LOGGED BY : GM

HOLE NO : TP 104 PROJECT REF : GS 577

PROJECT : Site Classification LOCATION : Rafferty's Resort

EQUIPMENT TYPE : 5t Excavator

GEOTECH\_SOLUTIONS\_03 LIBRARY GLB\_Log\_GS\_TESTHOLE\_LOG\_02\_GS\_577\_RAFFERTYS\_RESORT\_CAMS\_WHARF.GPJ\_<chamolige\*\*\*>25/10/2011 12:26\_8:30:002

DATE EXCAVATED : 22/09/11 LOCATION : See Drawing for location

CLIENT : Stevens Holdings Pty. Ltd.

SHEET : 1 OF 1

CHECKED BY :

CLIENT : Stevens Holdings Pty. Ltd.
PROJECT : Site Classification

METHOD: 400 mm bucket

LOGGED BY : GM

HOLE NO : TP 105 PROJECT REF : GS 577 SHEET : 1 OF 1

CHECKED BY :

LOCATION : Rafferty's Resort EQUIPMENT TYPE : 5t Excavator

DATE EXCAVATED : 22/09/11

LOCATION : See Drawing for location

NUMERIA DESCRIPTION       OBJECT       OBJECT <thobject< th="">       OBJECT       O</thobject<>													
Note     Section     Section     Section     Constrained       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10     10     10     10     10       10     10 <th>GROUND WATER LEVELS</th> <th>SAMPLES &amp; FIELD TESTS</th> <th>DEPTH (m)</th> <th>GRAPHIC LOG</th> <th>CLASSIFICATION SYMBOL</th> <th>MATEI Soil Type, colour, j Rock Ty Secondary</th> <th>RIAL DESCRIPTION plasticity or particle charact ype, colour, grain size y and minor components</th> <th>eristic</th> <th>MOISTURE / WEATHERING</th> <th>CONSISTENCY / REL DENSITY / ROCK STRENGTH</th> <th>BLOW COUNT)</th> <th>00 HAND 100 PENETRO- 100 METER 100 (kPa)</th> <th>STRUCTURE &amp; Other Observations</th>	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATEI Soil Type, colour, j Rock Ty Secondary	RIAL DESCRIPTION plasticity or particle charact ype, colour, grain size y and minor components	eristic	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	BLOW COUNT)	00 HAND 100 PENETRO- 100 METER 100 (kPa)	STRUCTURE & Other Observations
Note:         Note: <th< td=""><td>-</td><td></td><td>0.0</td><td>र रेट रेट रेट इंग के रेट रेट इ. रेस रेट रे रेस रेप रेप रे इ. रेस रेप रे इ. इंग्रे रेप</td><td></td><td>TOPSOIL, Sandy Clayey S to medium grained subroun</td><td>ILT, dark brown/ black, fine Ided to rounded gravel</td><td>grained sand, fine</td><td>D</td><td>F</td><td>3</td><td></td><td></td></th<>	-		0.0	र रेट रेट रेट इंग के रेट रेट इ. रेस रेट रे रेस रेप रेप रे इ. रेस रेप रे इ. इंग्रे रेप		TOPSOIL, Sandy Clayey S to medium grained subroun	ILT, dark brown/ black, fine Ided to rounded gravel	grained sand, fine	D	F	3		
10000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.0000 <t< td=""><td></td><td></td><td></td><td>。 。 。</td><td>- - -</td><td>Gravelly SAND, fine to mee grained subrounded to rour</td><td>lium graied sand, dark brov nded gravel</td><td>n, fine to medium</td><td></td><td></td><td>3</td><td></td><td></td></t<>				。 。 。	- - -	Gravelly SAND, fine to mee grained subrounded to rour	lium graied sand, dark brov nded gravel	n, fine to medium			3		
0.6       0.6       0.7       0.7       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0.1       0									D	St to VSt	16		
Program       10       0       Visite VM       0       Visite VM       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0 </td <td></td> <td></td> <td>0.5 —</td> <td></td> <td></td> <td>0.50m Gravelly Sandy CLAY, med medium grained sand, fine gravel</td> <td>lium plasticity, mottled grey to medium graned subroun</td> <td>brown, fine to ded to rounded</td> <td></td> <td></td> <td>17</td> <td></td> <td>-</td>			0.5 —			0.50m Gravelly Sandy CLAY, med medium grained sand, fine gravel	lium plasticity, mottled grey to medium graned subroun	brown, fine to ded to rounded			17		-
9       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0	Observed										12		
WATER / MOISTURE       SAMPLES & FIELD TESTS         VALER / MOISTURE       CONSISTENCY         No. Book       - Undetwood Sample         D       - Undetwood Sample         D       - Development         MOISTORY       - Development	Not		-								10		
WHTE / MOISTURE       SAMPLES & FIELD TESTS       CONSISTENCY       Image: Consistency of the state of a st	12:26 8.30.002		1.0						D	VSt to V⊢	8		-
WATER / MOISTURE       SAMPLES & FIELD TESTS       Testpit TP 105 terminated at 1.50 m         WATER / MOISTURE       SAMPLES & FIELD TESTS       Image: Consistency image: Consimage: Consimage: Consimage: Consistency image: Consimage: Consiste	ie>> 25/10/2011										7		
Water / MOISTURE       SAMPLES & FIELD TESTS       CONSISTENCY       RELATIVE DENSITY       ROCK STRENGTH         M       - 0       - 0       - 0       - 0       - 0       - 0       - 0         WATER / MOISTURE       Samples       - 0       - 0       - 0       - 0       - 0       - 0       - 0         M       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       - 0       -	.GPJ < <drawingf< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></drawingf<>												
WATER / MOISTURE       SAMPLES & FIELD TESTS       CONSISTENCY       RELATIVE DENSITY       ROCK STRENGTH         D       Dry       U       - Undisturbed Sample       VS       - Very Soft       RLATIVE DENSITY       ROCK STRENGTH         D       Dry       U       - Undisturbed Sample       VS       - Very Soft       RLATIVE DENSITY       RCK STRENGTH       RS       - Residual soil         WATER / MOISTURE       U       - Undisturbed Sample       VS       - Very Soft       S       - Kendum Dense       RS       - Residual soil         W       - Wet       OKC       - Disturbed Sample       S       - Soft       F - Firm       St       - Soft       Noredium Dense       RS       - Residual soil         W       - Wet       Wet inflow       SPT       - Standard Penetration Test       HP       + Hand/Pocket Penetrometer       VS       - Very Suff       H       + Hard       W       - Very Dense       W       - Very high       FR       - Fresh rock       SW       See Explanatory Notes for       GEOTECH SOLUTIONS PTY LTD       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -	T_CAMS_WHARF		1.5			1.50m	1450						
WATER / MOISTURE       SAMPLES & FIELD TESTS       CONSISTENCY       RELATIVE DENSITY       ROCK STRENGTH       RS       Residual sol         W Disturbed Sample       U       - Undisturbed Sample       VS       Very Soft       VL       - Very Loose       ROCK STRENGTH       RS       - Residual sol         W Wet       OMC- Optimum MC       D       - Disturbed Sample       VS       - Very Soft       VL       - Very Loose       L       - Loose       Modelium Dense       Notedium       RS       - Residual sol         VD       - Plastic Limit       B       - Buik Disturbed Sample       Stift       VS       - Very Suff       ND       - Dense       VD       - Very Dense       RS       - Residual sol         VS       - Very Suff       VS       - Very Suff       ND       - Dense       VD       - Very Dense       NW       - Dense       NW       NW       SW       SW <td>FERTYS_RESOR</td> <td></td> <td></td> <td></td> <td></td> <td>respit re 105 terminated a</td> <td>at 1.30 M</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	FERTYS_RESOR					respit re 105 terminated a	at 1.30 M						
WATER / MOISTURE       SAMPLES & FIELD TESTS       CONSISTENCY       RELATIVE DENSITY       ROCK STRENGTH       ROCK WEATHERING         M       Moist       D       - Dry       U       - Undisturbed Sample       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S       S	02 GS_577_RAF		.   .	-									
WATER / MOISTURE       SAMPLES & FIELD TESTS       CONSISTENCY       RELATIVE DENSITY       ROCK STRENGTH       RS - Residual soil         D       - Dry       U       - Undisturbed Sample       VS - Very Soft       VL - Very Loose       EL - Extremely low       VL - Very low       RS - Residual soil         W       - Wet       - Disturbed Sample       B       - Buikt Disturbed Sample       F - Firm       M - Medium Dense       M - Medium       H - Donse       W - Wet       W - Wet       W - Wet       W - Very high       EX - Stiff       VS - Very Stiff       H - Hard       W - Very Dense       M - Medium       H - Very high       EX - Stiff       SW - Slightly weathered       <	TESTHOLE_LOG			-									
WATER / MOISTURE       SAMPLES & FIELD TESTS       CONSISTENCY       RELATIVE DENSITY       ROCK STRENGTH       RS - Residual soil         D - Dry       U - Undisturbed Sample       D - Disturbed Sample       S - Soft       VL - Very Loose       EL - Extremely low       VL - Very low       RS - Residual soil         W - Wet       D - Disturbed Sample       S - Soft       F - Firm       S - Soft       N - Medium Dense       N - Medium       N - Medium         PL - Plastic Limit       M - Hand/Pocket Penetrometer       VS - Very Stiff       VS - Very Dense       VD - Very Dense       N - Medium       R - Firesh rock         See Explanatory Notes for details of abbreviations       See Explanatory Soft       GEOTECH SOLUTIONS PTY LTD       EXtremely high       EXtremely high	B Log GS		2.0	1	<u> </u>				<u> </u>	<u> </u>			l
See Explanatory Notes for details of abbreviations & basis of descriptions. GEOTECH SOLUTIONS PTY LTD	SOLUTIONS_03 LIBRARY.GLE	ATER / MC - Dry - Mois / - Wet MC - Opti L - Plas Wat	St mum M stic Limi	E IC t	SAMI U D ES B SPT HP	PLES & FIELD TESTS Undisturbed Sample Disturbed Sample Environmental sample Bulk Disturbed Sample Standard Penetration Test Hand/Pocket Penetrometer	CONSISTENCY         VS       - Very Soft         S       - Soft         F       - Firm         St       - Stiff         VSt       - Very Stiff         H       - Hard	RELATIVE DENS         VL       - Very Loos         L       - Loose         MD       - Medium I         D       - Dense         VD       - Very Dense	SITY se Dense se	RO EL L M H H H	CK ST - Ex - Ve - Lo - Me - Hi - Ve - Ex	RENGTH tremely low ery low w edium gh ery high tremely high	ROCK WEATHERING           RS         - Residual soil           XW         - Extremely weathered           DW         - Distinctly weathered           SW         - Slightly weathered           FR         - Fresh rock
	See deta & ba	Explanate ails of abbi asis of des	ory No eviatio criptio	tes for ons ns.		GEC	TECH SOLU	ITIONS PT	ΓΥ L <sup>-</sup>	TD			



Geotech Solutions Pty Ltd ABN: 18 125 808 620 P.O Box 4224, Edgeworth 2285 Unit 4/5 Arunga Dr, Beresfield 2322 [P] 0249 494300 [F] 0249 660485 [E] info@geotechsolutions.com.au

	Ρε	erth :	Sand	l Pen	etro	met	er R	epor	ť	
<b>Client:</b> Address: Job Number: Project: Location	Stevens PO Box GS 577 Stage 1 Cams W	Holding: 3171 ER Rafferty: /harf	s Pty Ltd INA NSW s Resort	2250		Report N Date Tes Report D Test Met	umber: ted: ate: hod:	Report 22.09.2 25.10.2 AS1289		
Test ID:	DCP1	DCP2	DCP3	DCP4						
Test Number:										
Retest of:										
Location		ļ	See Dtawing	GS577-004-1					-	
Depth (m):										
0.00 - 0.15	2	1	12	11						
0.15 - 0.30	2	3	8	10						
0.30 - 0.45	2	6	8	6						
0.45 - 0.60	6	5	10	4						
0.60 - 0.75	4	7	16	4						
0.75 - 0.90	4	9	7	3						
0.90 - 1.05	5	6	6	5						
1.05 - 1.20	6	5	7	7						
1.20 - 1.35										
1.35 - 1.50										
1.50 - 1.65										
1.65 - 1.80										
1.80 - 1.95										
1.95 - 2.10										
2.10 - 2.25										
2.25 - 2.40							ļ			
2.40 - 2.55							<u> </u>			
2.55 - 2.70										
2.70 - 2.85										
2.85 - 3.00										
Laboratory Lo	cation:	Beresfield				NATA Acc	reditation	Number:	15689	



This document is issued in accordance with NATA's accreditation requirements. The results of the tests, calibrations, and /or measurements included in this document are traceable to Australian/National standards.

Approved Signatory Form Number

I.G.Piper

RP51 - 2