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PORT OF HASTINGS DEVELOPMENT AUTHORITY

Port of Hastings Container Expansion Project - Contract PoHDA 2013-001

Factual Report on Marine Geotechnical Investigation

301010-01290 – SS-REP-0001

10 October 2014

Geotechnical

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In May 2016 the Special Minister of State asked Infrastructure Victoria to provide advice on the future capacity of Victoria's commercial ports. Specifically, the Minister has asked for advice on when the need for a second container port is likely to arise and which variables may alter this timeline. The Minister has also asked for advice on where a second container port would ideally be located and under what conditions, including the suitability of, and barriers to investing in, sites at the Port of Hastings and the Bay West location.

In undertaking this task, Infrastructure Victoria reviewed work that was completed as part of the Port of Hastings development project before it was cancelled in 2014. This document forms part of the initial work undertaken for the proposed port development at Hastings. Infrastructure Victoria considers that much of the previous Hastings work, although preliminary in nature, is relevant and suitable for informing a strategic assessment. Therefore, Infrastructure Victoria has made the reports previously commissioned for the development project part of the evidence base on which Infrastructure Victoria will use in providing the Minister with advice.

The opinions, conclusions and any recommendations in this document are based on conditions encountered and information reviewed at the date of preparation of the document and for the purposes of the Port of Hastings Development Project.

Infrastructure Victoria and its consultants have used the information contained in these reports as an input but have not wholly relied on all the information presented in these reports.






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FACTUAL REPORT ON MARINE GEOTECHNICAL INVESTIGATION**

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PROJECT 301010-01290 - PORT OF HASTINGS CONTAINER EXPANSION PROJECT - CONTRACT POHDA 2013-001

REV	DESCRIPTION	ORIG	REVIEW	WORLEY- PARSONS APPROVAL	DATE	CUSTOMER APPROVAL	DATE
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B	Revised draft for client review	<u>JH</u> J Hixson	<u>MNT</u> M Tran	<u>MNT</u> M Tran			
0	Final - Issued for use	<u>JH</u> J Hixson	<u>MNT</u> M Tran	<u>MNT</u> M Tran			
1	Revised following comments	<u></u> J Hixson	<u></u> M Tran	<u></u> M Tran			



EXECUTIVE SUMMARY

The Port of Hastings is an existing port facility located on the north-western shore of Western Port, Victoria. Currently it is primarily involved in the import and export of fossil fuels (oil, liquid petroleum gas and unleaded petrol).

The Port of Hastings has been identified for significant future development and expansion to accommodate the expected growth in container traffic as the Port of Melbourne reaches capacity. The Port of Hastings Development Authority (PoHDA) has been established to progress this expansion and, in October 2013, commissioned WorleyParsons to conduct a marine geotechnical site investigation and provide two factual reports (geotechnical and environmental) for the work (Contract PoHDA 2013-001) as part of its study to inform the planning and business case for the proposed development.

A marine geotechnical investigation was undertaken between 14 December 2013 (drilling of first borehole) and 24 July 2014 (completion of the last borehole) and comprised the following activities:

- Delivery of two jack-up barges (JUBs), Sealift 1 and Sealift 3 ("SL1" and "SL3"), drilling rig and equipment by road, and assembly at the Bluescope Steel Wharf;
- Daily mobilisation/demobilisation of JUBs and crew transfers;
- JUB positioning and jack-up activities;
- Cone penetrometer testing (CPT) at 21 locations;
- Near-shore geotechnical borehole drilling/coring operations at 94 locations using a drilling rig mounted on the JUB capable of wash boring and rotary coring, including Standard Penetration Testing (SPT) and;
- In situ shear strength measurement using a down-hole shear vane;
- Disturbed and undisturbed geotechnical soil sampling and environmental sediment sampling using a grab sampler at the seabed, SPT, piston sampler (60mm diameter) and pushed tube (U63) at depths from borehole drilling operations; and
- Sample storage and handling.

Selected samples from the geotechnical investigation have been subjected to laboratory testing for classification purposes and to assess engineering properties for design. The factual results of these tests have been presented in this report.

Where comment is required in order to assist in the interpretation of the factual data, this has been provided in this report.



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The boreholes and CPTs encountered a sequence of strata consistent with that anticipated from a review of published geological information and of past ground investigation data. The geology broadly comprised a variable thickness of unconsolidated loose sand and soft clay and silt deposits overlying generally loose to very dense sands and silty sands and stiff clays and silts. Some cemented horizons are present throughout the geological sequence.

Rock was encountered in 6 of the 94 boreholes drilled. Basalt rock was encountered at the surface at locations in the Western Channel and Anchorage, Port Area. Silurian mudstone rock was encountered at depths greater than 22m below seabed within two boreholes drilled between Esso Long Island Point and Bluescope, while basalt was encountered at a depth of 49.5m in borehole R1, drilled at the north western corner of the investigation area.

Cemented horizons were encountered throughout the sequence of tertiary deposits. These were generally thin i.e. less than 100mm thick, though some thicker horizons were encountered.

Data relating to the ground investigation, including borehole details, strata details, in situ test results, CPT records and laboratory testing results have been compiled in a data file in AGS RTA 3.1 format. This file has been provided for information alongside this report.

In addition, CPT data has been subjected to a preliminary interpretation using the CPeT-IT software package, and the results are appended to this report.



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1. INTRODUCTION

1.1 Background

The Port of Hastings is an existing port facility located on the north-western shore of Western Port, Victoria. Currently it is primarily involved in the import and export of fossil fuels (oil, liquid petroleum gas and unleaded petrol). Existing facilities include a jetty and depot at Stony Point, two liquid handling berths at Crib Point and another at Long Island and the BlueScope Steel jetty.

The Port of Hastings has been identified for significant future development and expansion to accommodate the expected growth in container traffic as the Port of Melbourne reaches capacity. The Port of Hastings Development Authority (PoHDA) has been established to progress this expansion and, in October 2013, commissioned WorleyParsons to conduct a marine geotechnical site investigation and provide two factual reports (one geotechnical report and one environmental report) for the work (Contract PoHDA 2013-001) as part of its study to inform the planning and business case for the proposed development.

The purpose of the marine site investigation is to understand the physical and chemical characteristics of strata in the proposed development site and surrounding area. Specifically, it aims:

- To collect soil and rock information to enable the establishment of the geological model of the seabed ground within the investigated areas;
- To allow the derivation of the physical, chemical and design engineering properties of the underlying sediment, soil and rock;
- To provide geotechnical inputs including design soil and rock parameters to the preliminary design of associated seawalls, reclamation works and wharf structures; and
- To undertake environmental sediment sampling to investigate contamination levels in sediments for dredging and spoil disposal, and other relevant design considerations.

1.2 Activities

The marine geotechnical investigation was undertaken between 14 December 2013 (the drilling of the first borehole) and 24 July 2014 (the completion of the last borehole) and comprised the following activities:

- Delivery of jack-up barges (JUBs), drilling rig and equipment by road, and assembly at the Bluescope Steel Wharf;
- Daily mobilisation/demobilisation of JUBs and crew transfers;

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- JUB positioning and jack-up activities;
- Cone penetrometer testing (CPT);
- Near-shore geotechnical borehole drilling/coring operations using a drilling rig mounted on the JUB capable of wash boring and rotary coring, including Standard Penetration Testing (SPT) and;
- In situ shear strength measurement using a down-hole shear vane;
- Disturbed and undisturbed geotechnical soil sampling and environmental sediment sampling using a grab sampler at the seabed, SPT, piston sampler (60mm diameter) and pushed tube (U63) at depths from borehole drilling operations; and
- Sample storage and handling.

The drilling, sampling and in situ testing has been undertaken in accordance with the specification for the project: Port of Hastings Development Project – Marine Geotechnical Investigation PoHDA 2013-001 – Specification.

1.3 Report Aims

This report and the associated data files present the factual geotechnical data obtained from the investigations, including:

- The as-drilled locations of each borehole/test site.
- A detailed geotechnical log of each borehole in general accordance with AS1726: Geotechnical Investigations, including strata type, strength, sample types and depths, in situ tests and other relevant details.
- The results of Cone Penetrometer Testing in CPeT-IT software output format.
- The factual results of soil laboratory testing.
- Borehole cross-sections (“gINT fence diagrams”) at selected locations through the site.
- Details of the electronic data supplied with this report in line with the Association of Geotechnical Specialists (AGS) data format.

The environmental aspects of the marine site investigation, including the results of the environmental testing are reported separately in WorleyParsons' Factual Report on Environmental Sampling (301010-01290-SS-REP-0002).



2. SITE DETAILS

2.1 Area of Investigation

The marine geotechnical investigation was conducted in and around the Port Waters in Western Port, Victoria, with key areas including Long Island Point and areas to the North of Long Island Point, the existing port channels and anchorage.

The investigation area encompassed the likely extent of the potential development footprint for the expanded Port of Hastings, its shipping channel and anchorage area.

A plan of the site area is presented in Appendix 1.

The investigation area was split into discrete areas by PoHDA. These are (refer to Appendix 1):

1. Port Area: This is further subdivided into two areas on the basis of seabed elevation at borehole locations: less than -2m CD and equal or larger than -2m CD. Boreholes in this area are designated as "S", "R", or "D" borehole series.
2. North Arm Channel ("N" boreholes).
3. Anchorage: The anchorage is an existing defined area approximately 300m north from the northern shore of Philip Island at Cowes. Boreholes in this area are prefixed "A".
4. Western Channel: This area encompasses the line of the existing shipping channel, running south from Stony Point towards the Fairway buoy at the entrance to the Western Channel. Boreholes in the Western Channel are prefixed "WC".
5. Groundwater Area: This area represents a broad area of coverage at the northern end of the investigation area, immediately north of the Port Area, with 4 boreholes ("G" boreholes) drilled for the purpose of assessing ground conditions in relation to hydrogeological properties.

2.2 Anticipated Geological Conditions

With reference to the geological map sheet for Western Port (1:63,000 scale), and the Geology of Victoria (Birch 2003), the geology in the vicinity of the project site comprises unconsolidated Quaternary deposits overlying upper Tertiary rocks and soils of the Westernport Group. These deposits are expected to unconformably overlie Silurian rocks comprising mudstones and sandstones. A table summarising the geological sequence is presented as Table 2.1 below:



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Table 2.1 Generalised Geological Sequence in the Project Area

Geological Period	Geological Epoch	Group Name	Formation Name	General Description
Quaternary	Holocene	Recent marine deposits		Anticipated veneer of mobile seabed sediments comprising sands and silts. Beach sand and mud flat deposits (mangroves) are present along the fringes of the channel.
Tertiary	Pliocene	Westernport Group	Baxter Formation	Ferruginous conglomerates, sandstones and claystones, ligneous (low-grade coals) in parts
	Miocene		Sherwood Marl	Marine calcarenites, marls and shelly sandstone beds
	Eocene		Older Volcanics	Fractured basalt, agglomerate and tuff interbedded with conglomerate sandstone and carbonaceous claystone. Expected to be discontinuous over the project area.
UNCONFORMITY				
Silurian			Silurian Mudstone	Mudstone, claystone and sandstone



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With reference to the Geology of Victoria, the Westernport Basin is broadly defined, in geological terms, by a series of N-NW trending faults, vertical movement of which has resulted in the creation of a sunken area now occupied by the channel. The channel itself is occupied by the Baxter Formation, the associated Sherwood Marl and the tertiary basalts (older Volcanics). These are weathered and overlain by recent sediments that have accumulated since submergence. The edges of the channel are generally fringed by extensive mangrove mud-flat deposits, though some gravel and siliceous sand deposits are present at Sandy Point and the northern coast of Philip Island.

Previous investigations in the channel have generally confirmed the above sequence, with boreholes encountering generally very soft clays, silts and loose sands at the surface, underlain by more competent stiff and very stiff clays and medium dense to dense sands.

Basalt has been encountered in some areas, though these were most prevalent in the southern portion of the site, in the North Arm Channel, Anchorage, and the Western Channel areas.



3. SCOPE OF WORK

3.1 Overview

The final scope of work comprised the following:

- Drilling of 94 boreholes to depths between 4.4m and 55.0m below seabed.
- 21 Cone Penetration Tests (CPT) to depths between 0.54m and 37.04m below seabed.
- Grab sampling at each of the borehole and CPT locations.
- Soil sampling and rock coring (for geotechnical and environmental testing) in the boreholes.
- Management of a geotechnical and environmental laboratory testing programme.
- Factual reporting: Geotechnical (this report), and Environmental (refer to Report 301010-01290-SS-REP-0002).

3.2 Boreholes

The as-drilled locations and depths of each borehole are summarised in Table 3.1. Plans showing the locations of the boreholes are presented in Appendix 1 - Drawings. Note that boreholes suffixed with an "r" refer to holes that were added at the latter stages of the drilling programme, or where the final location was revised significantly from that initially identified at tender.

Table 3.1 As-drilled Borehole Locations.

Reference	Easting (m)	Northing (m)	Seabed Elevation (m CD)	Final Depth (m below seabed)
North Arm Area (75 Locations)				
D1	348061.21	5763519.51	-9.490	13.95
D2	348425.36	5763213.00	-7.750	15.13
D3	348693.72	5762982.71	-9.970	13.45
D4	348122.15	5762828.53	-10.720	12.45
D5	348486.08	5762515.74	-12.030	10.95
D6	347810.14	5762462.69	-11.57	11.95
D7	348183.49	5762159.36	-11.750	11.30



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Reference	Easting (m)	Northing (m)	Seabed Elevation (m CD)	Final Depth (m below seabed)
D8	347492.85	5762103.28	-12.280	10.40
D9	347875.88	5761790.83	-12.480	11.09
D10	347184.64	5761741.70	-12.850	10.10
D11	347547.17	5761409.96	-12.580	10.35
D12	346860.69	5761369.97	-13.390	11.05
D13	347225.48	5761050.49	-12.670	10.40
D14	346546.22	5760957.77	-12.730	10.22
D15	346906.64	5760648.47	-14.080	9.45
D16	346226.91	5760598.56	-12.460	10.90
D17	346589.85	5760279.45	-16.560	7.45
D18	345943.77	5760259.53	-12.510	10.45
D19	346303.45	5759951.82	-13.480	9.95
D20	346673.29	5759638.88	-13.790	9.95
D21	346006.70	5759587.88	-15.240	7.90
D22	346372.79	5759277.40	-14.900	8.40
D23	346011.29	5758859.30	-14.710	9.55
D24	345524.15	5758627.58	-18.530	4.40
D25	346014.12	5758268.76	-14.490	8.40
D26	345533.39	5757822.86	-16.200	6.87
D27r	346659.24	5758998.76	-12.23	10.90
D30r	346155.83	5761594.19	-11.420	11.30
D32r	346115.69	5762329.30	-5.360	17.95
D33r	346482.80	5762010.14	-8.070	15.40
D35r	346429.29	5762700.29	-5.290	17.90
D36r	346804.09	5762379.81	-9.310	13.95



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Reference	Easting (m)	Northing (m)	Seabed Elevation (m CD)	Final Depth (m below seabed)
D38r	346750.01	5763073.21	-5.080	17.95
D39r	347111.58	5762756.52	-8.760	13.90
R1	346775.37	5763999.80	0.550	50.50
R2	347034.40	5763770.70	-1.640	19.80
R3	347388.40	5763455.90	-5.010	22.95
R4	346279.48	5763789.26	1.130	15.00
R5	346723.04	5763399.34	-2.550	20.50
R6	347443.20	5762789.10	-7.800	19.95
R7	346036.03	5763368.01	1.110	15.45
R8	346775.29	5762723.58	-7.680	15.45
R9	345637.16	5763021.40	1.370	15.40
R10	346088.39	5762670.12	-3.090	21.95
R11	346814.60	5762039.84	-9.860	15.77
R12	345771.85	5762309.11	-1.950	21.45
R13	346144.95	5761977.13	-7.810	49.65
R14	344967.90	5762371.10	1.350	18.45
R15	345459.40	5761916.16	-0.920	21.45
R16	346032.78	5761379.34	-9.470	18.45
R17	344773.23	5761890.65	0.950	16.95
R18	345142.08	5761558.20	0.700	49.95
R18A	345143.09	5761557.12	0.770	21.95
R19	345514.95	5761260.65	-5.830	19.95
R20	344837.53	5761198.16	0.820	23.50
R21	345577.15	5760571.28	-7.970	14.95
R22	344541.48	5760837.73	1.270	22.95



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Reference	Easting (m)	Northing (m)	Seabed Elevation (m CD)	Final Depth (m below seabed)
R23	344907.25	5760531.16	0.920	16.90
S1	347709.26	5763826.40	-0.780	49.95
S2	346521.19	5764208.43	1.328	14.95
S3	347750.28	5763149.25	-9.060	48.00
S4	347082.80	5763087.20	-6.540	49.95
S5	346398.60	5763050.90	-2.750	49.95
S6	347134.80	5762419.10	-10.910	49.95
S7	346456.22	5762361.29	-8.660	55.00
S8	345391.62	5762609.13	0.880	49.91
S9	346488.42	5761658.23	-11.270	50.15
S10	345810.51	5761598.90	-6.450	49.95
S11	345862.70	5760917.70	-8.020	50.45
S12	345209.25	5760886.71	-1.800	49.95
S13	345637.41	5759888.90	-8.720	50.38
S14r	345093.73	5759323.37	-10.700	34.50
S15	344585.61	5761480.42	1.200	49.90
S16r	345100.29	5759846.37	-10.77	29.50
S17r	345134.40	5760547.57	-2.030	49.90
North Arm Channel (10 Locations)				
N1	345438.00	5757628.30	-13.100	8.45
N2	345591.94	5755643.85	-17.010	5.45
N3	345535.50	5755003.41	-16.260	6.75
N4	345120.53	5754162.79	-14.720	7.95
N5	345951.95	5753492.37	-16.350	6.95
N6	346148.83	5752191.29	-16.560	6.01



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Reference	Easting (m)	Northing (m)	Seabed Elevation (m CD)	Final Depth (m below seabed)
N8	346460.28	5751738.19	-16.43	6.61
N9	346895.21	5750151.93	-16.750	6.40
N10	346088.39	5762670.12	-3.09	7.55
N11r	346814.60	5762039.84	-9.86	11.40
North Arm Groundwater Area (4 Locations)				
G1	347979.33	5764993.05	0.470	49.75
G2	349111.31	5764368.50	-2.040	50.95
G3	350409.16	5764386.83	-2.420	49.90
G4	349271.80	5763613.78	-12.160	50.40
Anchorage Area (3 Locations)				
A1r	347151.76	5745040.22	-14.77	9.50
A2r	347692.48	5744526.03	-15.38	8.30
A3r	346940.93	5743794.02	-15.84	7.95
Western Channel (2 Locations)				
WC3	345619.40	5745693.10	-15.170	8.92
WC4	342711.50	5743404.90	-17.400	6.10

3.3 In Situ Testing

The tested locations and end depths of cone penetration tests are summarised in Table 3.2.

Table 3.2 Cone Penetration Test – Tested Locations.

Reference	Easting (m)	Northing (m)	Seabed Elevation to Chart Datum (mCD)
C1	345019.19	5759940.02	-0.97
C2	345016.24	5759450.29	-1.08
C3	345047.10	5758968.61	-1.41
CPT-R11	346812.67	5762040.06	-9.83



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Reference	Easting (m)	Northing (m)	Seabed Elevation to Chart Datum (mCD)
CPT-R11A	As R11		
CPT-R14	344968.15	5762369.33	1.41
CPT-R15	345458.66	5761917.86	-1.18
CPT-R16	346031.54	5761378.05	-9.17
CPT-R18	345142.91	5761562.62	0.60
CPT-R18B	As R18		
CPT-R2	347035.20	5763771.60	-1.71
CPT-R21	345576.14	5760570.48	-8.07
CPT-R22	344543.35	5760837.77	1.28
CPT-R4	346280.36	5763790.82	1.13
CPT-R6	347442.40	5762788.20	-7.80
CPT-R9	345637.12	5763021.40	0.81
CPT-S1	346400.90	5763048.60	-1.06
CPT-S10	345812.53	5761599.54	-6.59
CPT-S12	345206.01	5760887.63	-1.71
CPT-S13	345637.19	5759890.75	-8.88
CPT-S3	347749.30	5763148.07	-5.06
CPT-S5	346400.90	5763048.60	-2.68
CPT-S7	346459.00	5762360.10	-8.41

3.4 Geotechnical Laboratory Testing

Geotechnical laboratory testing was undertaken to provide data to assist in the classification and engineering assessment of soils and rocks encountered during the drilling programme.

The geotechnical laboratory testing was performed by the following primary laboratories:

- Chadwick Geotechnical, Fiveways Boulevard, Keysborough, VIC.
- Coffey Information, Marine Parade, Abbotsford, VIC.



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The tests were split between the two primary laboratories on a borehole-by-borehole basis. A summary of the boreholes for which each laboratory was responsible is presented in Table 3.3 Boreholes Tested by Soil Testing Laboratory.

Table 3.3 Boreholes Tested by Soil Testing Laboratory

Laboratory	Boreholes
Chadwick Geotechnical	D1, D2, D3, D4, D5, D8, D9, D10, D11, D12, D13, D14, D15, D16, D17, D18, D19, D20, D21, D22, D23, D24, D25, D26, G2, N1, N2, N3, N4, N5, N6, N9, R2, R3, R5, R6, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R18A, R19, R20, R21, R22, R23, S1, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S15, WC3, WC4.
Coffey Information	A1r, A2r, A3r, C1, C2, C3, D6, D7, D27r, D30r, D32r, D33r, D35r, D36r, D38r, D39r, G1, G3, G4, N8, N10, N11r, R1, R4, R7, S2, S14r, S16r, S17r.

Details of the type and number of geotechnical tests undertaken are provided in Section 7.

For environmental testing, please refer to the Factual Report on Environmental Sampling 301010-01290-SS-REP-0002.



4. INVESTIGATION METHODOLOGY

4.1 Equipment

The equipment for the marine site investigation work was supplied by WorleyParsons' subcontractor Hagstrom Drilling, who engaged Australia Barge Hire (ABH) for the supply of two JUBs. Details are given in the following section.

4.1.1 Barges

The marine geotechnical investigation was executed from two Jack Up Barges (JUBs) owned and operated by Australian Barge Hire. The JUBs used were:

Table 4.1 Jack Up Barge Details

Name	Dimensions	Maximum Useable Leg Length
Sealift 1	9.3m x 18.0m	16m
Sealift 3	12.9m x 17.2m	25m

4.1.2 Supporting Vessels

The following supporting vessels were used to facilitate movement of the JUBs and the transfer of crew and equipment to/from the JUBs:

Table 4.2 Supporting Vessel Details

Vessel	Owner/Operator	General Duties
Sentinel	LW Marine	Barge relocation
Joint Venture	LW Marine	Barge relocation
Sea RIB 1	Hagstrom Drilling/ABH	Crew Transfer
Sea RIB 2	Hagstrom Drilling/ABH	Crew Transfer

LW Marine is Hagstrom's subcontractor for the project.

In addition to facilitating crew transfers, the Sea RIBs were also used to manoeuvre the barges in shallow, intertidal areas where the water depth was insufficient to permit access to the LW Marine vessels.



4.1.3 Drill Rig

Drilling equipment and crew was supplied by Hagstrom Drilling Pty Ltd. Each JUB was fitted with a UDR KL-100 drilling rig, with associated drilling and sampling equipment.

4.1.4 Borehole Drilling, Sampling and Testing Equipment

4.1.4.1. GRAB SAMPLING

For the collection of grab samples, a 5-litre Van Veen sampler was utilised. The sampler was deployed over the edge of the JUB and retrieved by hand, or with the use of an electric winch. Copies of the grab sample records including descriptions and photographs are presented in Appendix 2 - Grab Sample Logs.

4.1.4.2. SOIL DRILLING

Drilling in soil was progressed by the rotary mud method utilising a wireline cutting tool in conjunction with HWT (114.3mm OD) drill string. PWT casing (139.7mm OD) was used to case-off behind the advancing drill head as required by the conditions, and to provide a protection to the drill string between the JUB deck level and seabed.

4.1.4.3. ROCK DRILLING

Where rock drilling was required, the borehole was generally advanced using a HQ size (96mm OD) drill string in conjunction with a wire line HQ core barrel, which recovers a core of 61.1mm diameter.

As an exception, in borehole R1, where 1.0m of coring was undertaken at the base of the borehole, between 49.5m and 50.5m, the HQ barrel was mounted directly onto the SPT drill rods.

4.1.4.4. SAMPLE LOGGING

Materials recovered from the boreholes were logged in general accordance with AS1726 by a geotechnical engineer/engineering geologist from WorleyParsons who supervised the collection of samples and performance of in situ tests in accordance with the project specification.

Where applicable, for example for rock core logging, grab sample collection and environmental sampling purposes, photographs were taken of collected samples.

4.1.4.5. STANDARD PENETRATION TESTING (SPT)

Standard Penetration Testing equipment was provided as per the Specification. The sampling spoon comprised a split spoon open-ended sampler in conjunction with a core



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catcher. The materials encountered were such that no solid cone tool was required to be used on the project.

During testing in sandy materials, the water level inside the drill rod (casing) was maintained at a positive head above sea level to avoid the creation of “blowing sand” conditions at the base of the hole.

4.1.4.6. UNDISTURBED SAMPLING

Undisturbed samples were generally collected using thin-walled 63mm ID steel tubes (U63) in firm or stiff materials, or using thin-walled 60mm ID brass tubes (piston sampler) in very soft to firm cohesive soils. At selected locations and depths, U63 steel tubes were used to collect samples of sand to provide sufficient sample for abrasion testing.

4.1.4.7. WINDOWLESS SAMPLING

To assist in the collection of environmental samples and disturbed samples for geotechnical testing, a PVC-lined windowless sampler was utilised at selected locations. The windowless sampler recovers up to a 1.0m length 50mm diameter sample of soil in a PCV liner, which can then be cut open to allow visual examination and sub sampling. Where employed, the use of the sampler is identified in the comments and observations column of the borehole logs.

4.1.4.8. DOWN-HOLE SHEAR VANE

At selected locations in very soft and soft soils, a down-hole shear vane was used to assess the in situ undrained shear strength of cohesive soils. The tests were conducted in general accordance with as 1289.6.2.1. Results and details of the vane tests are presented in Section 5.3 and a calibration certificate for the vane is presented in Appendix 3 - Downhole Vane Calibration Certificate.

4.1.4.9. HAND SHEAR VANES

Undisturbed samples of cohesive material recovered from the boreholes were subjected to hand shear vane testing using a Geotest E-286 Inspection Vane. The peak value of the vane shear strength measured is displayed on the logs. Note that the Geotest E-286 presents hand vane strength based on a theoretical relationship between the vane size and the measured torque.

Where possible, the residual shear strength was also measured, and is reported on the logs where applicable. The residual shear strength was obtained by rotating the vane until the recorded value levelled off at a minimum value. This was noted to require between 6 and 10 turns of the vane.



4.1.5 Cone Penetration Testing

In addition to the drilling equipment, Sealift 3 was equipped with a 200kN (max. thrust) Hyson Cone Penetration Testing (CPT) unit.

The unit comprises a stand-alone push frame, which was deployed over the drilling moon hole following sliding back of the drill rig on a bespoke floor frame. The push frame is supplemented with rod stiffeners and supporting casing to provide lateral support to the CPT rods between the barge deck and the sea bed.

Details of the tests and the type and size of cones used can be found in Section 6.

4.2 Positioning

Positioning of the barges was undertaken using a Topcon GR3 DGPS receiver in conjunction with a Getac PS236 hand-held unit running Pocket 3D survey software.

The DGPS receiver was configured to measure to the Geodetic Datum Australia 94 (GDA94) co-ordinate system with real-time correction provided over the Telstra network, and was capable of less than 20 mm accuracy in the horizontal plane.

For vertical measurement, the unit was configured to AusGeoid2009 vertical datum, which permits accuracies of less than 30 mm when combined with real-time correction. The AusGeoid2009 datum is a Mean Sea Level (MSL) datum and is synonymous with Australian Height Datum (AHD).

For Port of Hastings area, the Chart Datum (CD) which is based on Lowest Astronomical Tide (LAT) is 1.69 m below the Australian Height Datum (AHD).

As a back-up, each barge was equipped with a hand-held Garmin E-Trex GPS capable of a horizontal positional accuracy of 3m. This was used to provide a basic check on the positions. Further back up was also provided by the on-board GPS units on each of the crew transfer RIBs.



5. BOREHOLE DRILLING

5.1 Geotechnical Drilling

The results from the geotechnical drilling are presented on the borehole logs in Appendix 5 Appendix 3 - .

Borehole R18A was drilled adjacent to borehole R18, where low SPT N values (1 to 3) were recorded for stiff to very stiff seabed ground between depths approximately 15 m to 22m, to re-confirm the consistency of the in situ ground over that depth. Refer to Section 5.4 below for further discussion on the low SPT N for fine grained soils observed at the site.

5.2 Ground Conditions

5.2.1 General

The boreholes and CPTs encountered a sequence of strata consistent with that anticipated from a review of published geological information and the past ground investigations. A summary of the findings from each of the drilling areas is presented below.

Rock was encountered in 6 of the 94 boreholes drilled. Basalt rock was encountered at the surface at locations in the Western Channel and Anchorage, Port Area, Silurian mudstone rock was encountered at depths greater than 22m below seabed within two boreholes drilled between Esso Long Island Point and Bluescope, while basalt was encountered at a depth of 49.5m in borehole R1, drilled at the north western corner of the investigation area.

Cemented horizons were encountered throughout the sequence of tertiary deposits. These were generally thin i.e. less than 100mm thick, though some thicker horizons were encountered.

5.2.2 North Arm (Port Area)

The surface material over the site is noted to comprise a thin veneer of very loose unconsolidated sand and silty sand which covers much of the area. In the intertidal zone, in the west of the north arm area, this loose sand is underlain in places by very soft, grey, high plasticity, often shell-rich clay to an approximate maximum depth of 6.0m.

These recent, surficial deposits are underlain by a vertically and laterally variable sequence of stiff and very stiff grey and pale brown/orange clays and sandy clays, or pale grey to yellow sands and silty sands of loose to dense consistency. Laterally discontinuous dark brown, silt and fine sand horizons are found at different elevations within this sequence.

Between approximate depths of 15m to 20m the geology becomes more consistent, with the boreholes recording a change to grey-green or olive green silty fine sands of medium



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dense to very dense consistency, and sandy silt of stiff to hard consistency. Frequent cemented beds are recorded within these materials, resulting in high SPT N values and SPT refusals. All but three of the boreholes in the north arm area terminated within these materials, with the deeper (50m) boreholes sometimes recording thicker (up to 5m thick) dark green cemented zones with higher shell content at depths in excess of 40m below seabed level.

Basalt was encountered at a depth of 49.0m in a single borehole within the north arm port area: borehole R1. It was noted to be highly fractured and fragmented, with a weathered mantle comprising grey, high plasticity clay with variable gravel content.

Silurian bedrock was encountered in boreholes S14r and S16r, at depths of 27.5m and 21.9m respectively. It was recorded to comprise a light grey and yellow brown siltstone.

5.2.3 North Arm Channel

Boreholes drilled within the north arm channel recorded a variable sequence of very stiff and hard clay and quartz sand and fine gravel beneath a surface covering of very loose sand. In places the surface sand is capped with a thin 20mm thick veneer of coralline, cemented sand.

The clay strata were recorded as mottled yellow, brown, grey and occasionally red, and were of stiff to very stiff consistency.

A basalt gravel/gravelly clay material was recorded in boreholes N2, N4 and N5, recovered as a dark grey to black angular basalt within a matrix of high plasticity clay.

5.2.4 Anchorage

The material encountered within the three boreholes drilled at the anchorage comprised sand and silty sand over a weathered basalt profile. Basalt was encountered in two of the boreholes (A1r and A2r) from a depth of 2.2m, initially being an extremely weathered basalt, recovered as a clay and gravel mix and becoming less weathered with depth.

5.2.5 Western Channel

Two boreholes, WC3 and WC4 were drilled in the western channel. Beneath the surface covering of loose sand and gravel, WC3 recorded medium dense to very dense silty sand to the termination of depth of 8.92m. WC4, drilled approximately 3.7km from WC3, recorded variably weathered basalt from the seabed surface to the termination depth of 6.1m.

5.3 Down-Hole Shear Vane

The results from down-hole shear vanes undertaken on site are summarised in the following table:



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Table 5.1 Down-Hole Shear Vane Readings.

Borehole Reference	Depth (m below seabed)	Vane Size (mm)	Peak Torque Reading (Nm)	Remoulded Torque Reading (Nm)
G1	1.0	62 x 128	6.0	1.5
R1	1.2	62 x 128	Material too soft to support weight of vane and rods	
R1	17.1	62 x 128	500*	Not possible
R15	0.40	48 x 96	1.5	Not measured
R16	0.55	62 x 128	3.0	Not measured
R18a	16.0	48 x 96	30.0	Not measured
R20	1.0	62 x 128	3.0	2.0
S17r	2.5	62 x 128	5.5	4
	4.0	62 x 128	13	1.5
	5.5	62 x 128	16.0	7.0
* Result considered unreliable. Over-sampling of vane test interval recorded soft silt, not consistent with test result indicative of very stiff material.				

Conversion to estimated vane shear strengths has been undertaken using the formula:

$$\tau = M/K$$

Where:

τ is Vane Shear Strength

M is the torque to shear the soil (in Nm).

K is a constant depending on dimensions and shape of the vane.

For the 62mm x 128mm vane used on site, K is equal to 0.898.

For the 48mm x 96mm vane used on site, K is equal to 0.413

The resulting vane shear strengths, calculated using the above expression, are:

Table 5.2 Calculated Vane Shear Strengths.

Borehole Reference	Depth (m below seabed)	Peak Vane Strength (kPa)	Remoulded Vane Strength (kPa)
G1	1.0	6.7	1.7



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Borehole Reference	Depth (m below seabed)	Peak Vane Strength (kPa)	Remoulded Vane Strength (kPa)
R1	1.2	N/A	
R1	17.1	556*	N/A
R15	0.4	3.6	N/A
R16	0.55	3.3	N/A
R18A	16.0	72.0	N/A
R20	1.0	3.3	2.2
S17r	2.5	6.0	4.5
	4.0	14.5	2
	5.5	18.0	8.0
* Result considered unreliable. Over-sampling of vane test interval recorded soft silt, not consistent with test result, which was indicative of very stiff material.			

5.4 Standard Penetration Tests (SPT) – A Note on Data Interpretation

The results of standard penetration tests are presented on the logs and included within the AGS data file.

In fine grained soils, there are correlations between SPT “N” value and undrained shear strength that are used by engineers to infer soil engineering properties based on the N value alone. In general, the use of such a correlation would assume that very low N values, of N equals zero to N equals five, for example, would be indicative of very soft and soft materials. However, during the geotechnical investigations at the project site, there were instances where low SPT N values were recorded, but where subsequent tactile examination of the soil recovered in the SPT sampler and/or comparison with adjacent undisturbed samples has identified fine grained soils of stiff and very stiff consistency.

In fine grained soils, the SPT N value can vary with changing plasticity, sensitivity and fissuring state. While fissuring has not been generally observed in the recovered samples, plasticity and sensitivity are noted to vary across the site.

With respect to plasticity, relationships with N value that account for varying plasticity are provided in the literature, such as Terzaghi and Peck (1967), and Sowers et al. (1979) etc. Sowers et al. (1979) suggested that for a given SPT N value, a five-fold variation in undrained shear strength may be observed between high plasticity and low plasticity clays.



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Additionally, a change in soil sensitivity can produce a variation in penetration resistance in fine grained soils, where a significant proportion of the resistance is derived from side shear on the sampling spoon. A review of hand vane results and CPT data indicate a variation in soil sensitivity for the soils tested between Slightly Sensitive and Medium Quick, with more than half of the results being Very Sensitive or higher.

Given the above field observations, to avoid possible misrepresentation of the soil strength for this site, readers are advised to avoid relying on the SPT N data in isolation from other available data to infer the soil strength where low SPT N values are recorded in fine grained soil. In those instances, the readers are recommended to review in situ test data in conjunction with the soil description and strength terms presented on the borehole logs. In particular, Table 5.3 presents a list of boreholes and tests that recorded low SPT N values (N = 5 or less) in fine grained soil together with the logged consistency based upon visual and tactile assessments of the collected soil sample. Note that where low N values have been recorded in soils of very soft and soft consistency, these have been omitted from Table 5.3.

Table 5.3 Boreholes recording N=5 or less in fine grained soils.

Borehole Reference	Depth (m below seabed)	Material Type	Undrained Strength Descriptor (from visual and tactile assessment of the collected soil sample)	Seating Blows	N Value
BHD32r	10.50	Sandy Clay	Stiff	1	1
BHR10	17.00	Sandy Clay	Firm	11	3
BHR16	3.00	Silt	Firm	2	0
BHR16	3.50	Silt	Firm	0	0
BHR16	10.50	Silty Clay	Stiff	0	0
BHR18	19.50	Sandy Clay	Stiff	3	3
BHR18	21.00	Silty Clay	Stiff	0	1
BHR20	12.10	Silty Clay	Very Stiff	1	3
BHR3	15.00	Sandy Clay	Firm	0	1
BHR5	10.50	Silty Clay	Firm/Stiff	0	5
BHR5	12.00	Silty Clay	Stiff	0	1
BHR6	7.50	Silty Clay	Very Stiff	1	0
BHR8	10.50	Clayey Silt	Firm	0	4
BHR8	12.00	Clay	Stiff	1	3



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Borehole Reference	Depth (m below seabed)	Material Type	Undrained Strength Descriptor (from visual and tactile assessment of the collected soil sample)	Seating Blows	N Value
BHS1	12.00	Silt	Stiff	0	5
BHS1	13.50	Silt	Very Stiff	1	5
BHS4	10.50	Clayey Silt	Stiff	0	1
BHS5	9.00	Sandy Clay	Stiff	3	3
BHS8	10.00	Silty Clay	Stiff	0	0

In addition to those tests listed in Table 5.3, several tests recorded low SPT N values in samples that, under a rigid application of the AS1726 soil classification to the soil grading results, should be classified as coarse grained. That being the case, the role of plasticity and sensitivity would be deemed not to apply. However, it is recognized that the AS1726 soil classification does not account for the engineering behaviour of soils, and a soil may end up being classified as sand due to having a fines content of less than 50%, even though the amount and mineralogy of the fines present in the sample can dominate its engineering behaviour. We consider that the SPT tests listed in Table 5.4 may represent materials that behave as fine grained soils despite the AS1726 classification. Based our field tactile assessments, the relative density term provided in Table 5.4 (which was based on a rigid application of AS1726) is unlikely to reflect the actual soil state and engineering response, and we suggest that consideration and engineering judgement is given to this matter during design.

Table 5.4 Low SPT Tests in coarse grained soils – based on AS1726

Borehole Reference	Depth (m below seabed)	Material Type	Relative Density Term (based upon N Value)	Seating Blows	N Value
BHD33r	7.50	Silty SAND	Loose	2	5
BHD36r	7.50	Clayey SAND	Loose	0	5
BHG2	22.00	Silty SAND	Loose	0	5
BHR13	6.00	Clayey SAND	Very Loose	0	0
BHR18	9.00	Silty SAND	Loose	2	4
BHR18	15.00	Silty SAND	Very Loose	0	2
BHR18	16.50	Silty SAND	Very Loose	4	2



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Borehole Reference	Depth (m below seabed)	Material Type	Relative Density Term (based upon N Value)	Seating Blows	N Value
BHR22	10.50	Silty SAND	Loose	2	5
BHR8	9.00	Clayey SAND	Loose	1	5
BHS1	16.50	Clayey SAND	Loose	1	5



6. CONE PENETRATION TESTING

6.1 Cone Details

The cones used comprised EN ISO 22476-1 2012 Class 1 and Class 2 cones manufactured by a.p. Van Den Berg.

The cones have a cone surface area of 10cm² and were fitted with a piezometer mounted in the u_2 position (behind the cone shoulder).

For parameter estimation purposes, the cones have an area ratio of 0.75.

Copies of the calibration certificates of the cones used are presented in Appendix 5 - Cone Penetration Testing.

6.2 CPT Locations and Procedure

Cone penetration testing was undertaken at locations listed in Table 3.2 and to the depths presented on Table 6.1.

Table 6.1 Cone Penetration Testing – Final Depths.

CPT Reference	Seabed Elevation to Chart Datum (m CD)	Final Depth (m below seabed)
C1	-0.97	21.66
C2	-1.08	4.50
C3	-1.41	25.00
CPT-R11	-9.83	1.68
CPT-R11A		13.82
CPT-R14	1.41	16.50
CPT-R15	-1.18	18.40
CPT-R16	-9.17	18.30
CPT-R18	0.60	6.82
CPT-R18B	0.60	37.04
CPT-R2	-1.71	9.36
CPT-R21	-8.07	8.48
CPT-R22	1.28	5.74



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CPT Reference	Seabed Elevation to Chart Datum (m CD)	Final Depth (m below seabed)
CPT-R4	1.13	10.38
CPT-R6	-7.80	16.00
CPT-R9	0.81	0.54
CPT-S1	-1.06	8.32
CPT-S10	-6.59	34.26
CPT-S12	-1.71	13.84
CPT-S13	-8.88	15.30
CPT-S3	-9.06*	5.00
CPT-S5	-2.68	9.96
CPT-S7	-8.41	16.80
* Elevation based on measurement at S3 borehole location 1.53m away		

The CPT was generally undertaken in two stages:

1. an initial push from seabed to a depth of approximately 2.5m to 3.0m was carried out without lateral support to the CPT rods, then
2. the rods were removed and the hole drilled out to approximately 0.2m above the initial termination depth to permit the installation of the support casing and rod stiffeners. Subsequently, a second CPT push was undertaken until refusal.

At the commencement of all tests, the cone readings were zeroed at the seabed level, and the cone pushed through the soil, or lowered to the testing start depth using the push frame.

It should be noted that where soft soils were expected based upon observing the leg penetration of the barge, the initial CPT push (from seabed) was undertaken using a more sensitive Class 1 cone until stronger material was encountered. The second push, following drill-out and installation of the casing and rod stiffeners, was subsequently undertaken using the Class 2 cone.

6.3 Refusal Criteria

Refusal of the CPT was based on one or more of the following criteria being reached:

1. Exceedence of the maximum permissible cone resistance (q_c) of 75MPa.



2. Exceedence of the permissible maximum thrust of the push frame of 160kN (16T).

6.4 CPT Drill-Out Locations

In selected CPT holes, following initial refusal of the CPT, a drill-out procedure was requested by PoHDA whereby potential and identified hard ground layers were drilled out and the CPT was resumed in the potentially weaker layers beneath. Three (3) CPT drill-outs have been performed for the site. Details of these locations are presented on Table 6.2.

Table 6.2 CPT Drill-Out Locations.

CPT	Start Drill Out Depth (m below seabed)	End Drill Out Depth (m below seabed)
CPT-S10	3.3	32.0
CPT-R11	0.0	3.0
CPT-R18	0.0	35.0

6.5 Dissipation Testing

Dissipation testing was undertaken in zones of very soft or soft soil at the following locations:

Table 6.3 Locations and Depths of Dissipation Tests.

CPT Reference	Depth of Test (m below seabed)	Estimated Coefficient of Horizontal Consolidation (C_h) (m^2/yr)
C1	2.0	147
C1	4.0	525
C3	2.0	Estimation not possible due to porewater pressure value rising over test duration. 50% dissipation not reached.
CPT-R18	2.0	26
CPT-R22	1.5	Estimation not possible due to porewater pressure value rising over test duration. 50% dissipation not reached.
CPT-R22	3.0	71



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In general, the tests were progressed until at least 50% dissipation of maximum porewater pressures had been observed, or until such a time that the observed behaviour indicated that reasonable results could not be obtained.

Where the results permit, estimation of the horizontal coefficient of consolidation (C_h) has been undertaken within the CPeT-IT software package. Where the results recorded an initial increase in porewater pressure, as is common in over-consolidated cohesive soils, C_h was estimated from the decreasing portion of the curve in line with the suggested method from Sully and Campanella (1994), cited in Burns and Mayne (1998).

6.6 CPeT-IT Reports

Summary reports of the CPTs have been prepared using the software package CPeT-IT. The package allows a rapid assessment of soil parameters based upon well-known correlations. Copies of the output reports are presented in Appendix 5 - Cone Penetration Testing, and include a description of the correlations used.



7. GEOTECHNICAL LABORATORY TESTING

7.1 Overview

Geotechnical laboratory testing was undertaken on selected samples retrieved from the ground investigation. An initial schedule of testing was produced by WorleyParsons and forwarded to PoHDA for review, who then returned a final schedule to WorleyParsons for implementation. Refer to Section 3.4 for details of the soil laboratories.

7.2 Test Details

The following laboratory tests were undertaken. Copies of the laboratory test reports are presented in Appendix 6 - Laboratory Testing Results together with a summary table presenting the results.

Table 7.1 Summary of Laboratory Tests Undertaken.

Test	No.	Test method
Soil moisture content test	861	AS1289.2.1.1
Atterberg Limits	396	AS1289.3.1.1/3.1.2/3.2.1/3.3.1/3.4.1
Particle size distribution - analysis by sieving	97	AS1289.3.6.1
Particle size distribution - analysis by sieving and hydrometer	620	AS1289.3.6.1/3.6.3
Particle size distribution - Standard method of fine analysis using a hydrometer using seawater	170	AS1289.3.6.1/3.6.3
Undrained triaxial compression without measurement of pore water pressure (Single Stage)	137	AS1289.6.4.1
Saturated consolidated triaxial compression with pore water pressure measurement (Single Stage)	7	AS1289.6.4.2



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Test	No.	Test method
One-dimensional consolidation properties of a soil (8 Stages)	36	AS1289.6.6.1
Saturated consolidated triaxial compression with pore water pressure measurement (Multi-Stage)	18	AS1289.6.4.2
Particle Specific Gravity	178	AS1289.3.5.1
Organic Content	91	APHA2540E (NATA)
Permeability Testing	22	AS1289.6.7.3
Abrasivity	19	Slurry Abrasion (Miller) Test. ASTM GA075.
Angularity and Roundness	77	Scanning Electron Microscope imagery
Mineralogy - Silica, quartz and carbonate content	136	X-Ray Diffraction
Rock - Point Load Tests	19	AS4133.4.1
Rock - Petrographic Analysis	5	non-NATA
Rock - Cerchar Abrasivity	2	ASTM D7625 - non-NATA
Rock - X-ray Diffraction (X-ray and visual observation)	1	non-NATA
Rock Uniaxial Compressive Strength (UCS) test	11	AS4133.4.2.1
Durability Testing - resistivity, pH, chloride and sulphate content	89	Chloride: MGT Method 1100A-Nata Accredited
		Sulphate: MGT Method 1110A-Nata Accredited
		Resistivity: Inverse of conductivity by 1:5 aqueous extract
		pH - NEPM Schedule B (3) Method 103



7.3 A Note on Soil Descriptions

The soil type descriptions noted on the laboratory records are preliminary descriptions based upon the material summary on the hand-written field borehole logs. As such, they may not accurately reflect the soil type determined from a review of the available test data for a given sample, and thus shall not be relied upon as for any engineering work. Instead, the borehole logs shall be used for correct soil description.

7.4 Particle Size Distribution (PSD) with Hydrometer

7.4.1 General

In order to appropriately classify the soils encountered in the ground investigation and to provide information for dredging, selected soil samples were subjected to a full particle size determination including definition of the fine fraction ($<75\mu\text{m}$) using a hydrometer.

In addition to standard hydrometer testing, which uses distilled water, PoHDA requested that selected samples were subjected to hydrometer determination using seawater as the fluid.. The test method adopted was identical to the standard AS1289.3.6.3 with the exception of the change from freshwater to seawater. Where seawater is used, it is stated on the test report in Appendix 6 - Laboratory Testing Results.

The seawater used in the hydrometer tests was collected from the project site, generally obtained at approximately 0.3m below the sea surface.

7.4.2 Unusual Behaviour in Test Curves

It is noted that some of the PSDs report results where the percentage passing on the hydrometer portion of the test curve (the fines portion, $<75\mu\text{m}$ particle size) increases above the percentage passing from the sieving part at $75\mu\text{m}$ particle size. This is not consistent with the expectation that the percentage of particles passing should decrease with particle size.

A review of the test results and test procedures has established that the “mismatch” at the fines level ($75\mu\text{m}$ particle size) of these PSD curves was due to the results being obtained from two different test methods (sieving vs hydrometer); and the sensitivity of the hydrometer test to the proportion of fines in the prepared sample. Where the sample contains very fine sand/coarse silt, these coarser particles settle out quickly, resulting in the remaining sample having a relatively low sediment load. This results in the soil/fluid mix being more sensitive to other factors that can impact upon the result measured by the hydrometer, such as temperature.

For the PSDs where this behavior is observed, the “mismatch” was however observed to be minimal in value and is not considered to materially affect the ability to interpret the PSD results.



7.5 Abrasion Testing

A total of 19 abrasion tests have been undertaken on samples of soil retrieved from the boreholes and grab samples. The testing was undertaken using the Slurry Abrasion method (ASTM G75 - 07 (reapproved 2013)).

The results of the slurry abrasion can be found in Appendix 6 - .

7.6 Permeability Testing

Where permeability testing has been undertaken, it has been undertaken within a triaxial cell. Where the tested samples are derived from disturbed samples from SPTs, the sample is prepared by compacting into a sample mold with a laboratory density ratio of 100% and a laboratory moisture ratio of 100% at the natural moisture content.

7.7 One-Dimensional Consolidation Testing

One-dimensional consolidation testing has been undertaken on selected piston samples and push tubes. In general the tests comprised eight load stages, incorporating an unload stage to permit estimation of heave characteristics. However, some tests report fewer load stages due to errors in recording measurements.

7.8 Consolidated Undrained Triaxial Tests

Consolidated undrained triaxial tests with porewater pressure measurement (CUPPs) have been undertaken on selected samples either as single-stage or multistage tests.

Where multistage tests have been undertaken, the effective cohesion (c') and effective angle of friction (ϕ') have been determined by the laboratory and displayed on the test report.

Where the test is single-stage, an effective friction angle has been estimated based upon an assumed effective cohesion of zero, with the result being recorded in the AGS data tables.



8. AGS DATA

8.1 General

In line with the project Specification, the results from the borehole drilling, cone penetration testing and laboratory testing have been entered into the geotechnical data management software gINT using the AGS RTA 3.1 data format.

The following data is included:

- Borehole records;
- CPT logs;
- Laboratory testing, excluding abrasion, angularity, mineralogy and petrography, and organic content for which no entry template is available.
- Results of environmental testing (reported in Factual Report on Environmental Sampling (301010-01290-SS-REP-0002)).

The resulting data file has been supplied in .ags format on the enclosed USB flash drive.

Borehole cross-sections ("gINT fence diagrams") at selected locations through the site generated from this gINT database are shown in Appendix 1 - Drawings.

8.2 Historical Data

8.3 Sources of Historical Data

In addition to the data generated by this marine geotechnical investigation, the project Specification also required entry of data from past geotechnical investigations in the project area. These include:

- McDonald Wagner and Priddle, Long Island Point Liquids Pier site investigation, 1967. Source data comprises cross sections only, relating to 19 boreholes.
- Harris Lange and Partners ground investigation, 1969 (also referred to as the John Lysaght investigation). Source data comprises cross sections only for 16 boreholes.
- Maunsell and Partners, Westernport Site Investigation for I.P.E.C Terminal, July 1978. Report on investigation comprising 9 boreholes.
- Public Works Department, Victoria, Ports and Harbours division, Westernport Bay, Victoria, Report on Seabed Investigation. August 1974. Report on investigation comprising 38 boreholes.



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- Aecom. Port of Hastings Stage 1 Development. Logs for 11 boreholes, 22 test pits and 9 dynamic cone penetration tests.

The historical data has been entered into the gINT format and is supplied as separate .ags data files.

8.4 Identified Limitations of Historical Data

8.4.1 General

The historical information provided to WorleyParsons for entry into gINT comprises a collection of scanned logs, reports and outline sections.

It should be noted that many of the historical data sources pre-date the AS1726 (1993): Geotechnical Site Investigations standard for soil description and the associated standards for geotechnical testing and reporting. Since the AGS RTA 3.1 format template is based upon AS1726 and its related documents, it has therefore been necessary to modify the soil descriptions from their original form, and while every effort has been made to remain as true to the original description as possible, some changes may impact on interpretation of the soil description. Due caution is therefore urged when using and interpreting the historical data and reference to the original documents is recommended.

Limitations related to the historical data and modification efforts made are summarised below.

8.4.2 McDonald Wagner and Priddle, Long Island Point Liquids Pier site investigation

- The information provided is limited to a set of diagrammatic logs presented as a drawing.
- The plan of the site is related to a local grid and not tied into a national survey coordinate system. To address this, co-ordinates have been estimated using the available plan in conjunction with Google Earth™. There may, therefore be some errors with the coordinates provided and they may differ from as-drilled co-ordinates by up to 10m.
- The logs state that the elevations are provided to Chart Datum and are presented in feet. These have been converted to metric units.
- The dimensions on the log sections and strength terms are provided in imperial units and have been converted into metric and SI units where appropriate.
- Some soil descriptions are missing strength terms. Where this is the case, the strength column on the gINT log has been left blank.
- Some boreholes present no SPT information in granular materials.



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- The investigation pre-dates the recent standards for the SPT. Where SPT data are presented we have applied a relative density descriptive term (e.g. dense) on the assumption that the test method and equipment is compliant with current practice.
- No driller information or dates of drilling are available.

8.4.3 Harris Lange and Partners ground investigation (John Lysaght investigation)

- The information provided is limited to a set of diagrammatic logs presented as a drawing.
- It was not possible to read the start elevation for BH9. Hence, the subsequent depths could not be established. This borehole has therefore been omitted from the AGS file.
- The plan of the site is related to a local grid and not tied into a national survey coordinate system. To address this, co-ordinates have been estimated using the available plan in conjunction with Google Earth™. Given the age of the plan provided, there are few common reference points between the plan and modern satellite imagery that allow the position of the boreholes to be estimated relative to current features. There may, therefore, be some errors with the coordinates estimated and they may differ from as-drilled co-ordinates by up to 50m.
- The logs state that the elevations are provided to the datum L.W.I.S.T = 0.0. The relationship between L.W.I.S.T and current Australian Height Datum is not known.
- The dimensions are presented in feet, and have been converted to metric units.
- The dimensions on the log sections and strength terms are provided in imperial units and have been converted into metric and SI units where appropriate.
- Some soil descriptions are missing strength terms. Where this is the case, the strength column on the gINT log has been left blank.
- Some boreholes present no SPT information in granular materials.
- The investigation pre-dates the recent standards for the SPT. Where SPT data are presented we have applied a relative density descriptive term (e.g. dense) on the assumption that the test method and equipment is compliant with current practice.
- No driller information or dates of drilling are available.

8.4.4 Maunsell and Partners, Westernport Site Investigation for I.P.E.C Terminal

- The logs as presented in the pdf document did not always reflect the results of the associated laboratory testing data. Where possible, WorleyParsons amended the soil classification symbol (i.e. CL, SP etc.) to reflect the results of laboratory testing.



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- Co-ordinates are provided. However, the datum is not stated. It is therefore assumed that the coordinates are relative to the AMG66 datum.
- Borehole BL5 stated a casing depth of 4.5m despite a final hole depth of 3.5m being presented on the log. The data entry has been adjusted to reflect a shallower casing depth of 3.5m.
- Where SPT data are presented, there is not always a breakdown of the blows for each 150mm. In these instances only the final N value has been entered.

8.4.5 Public Works Department, Victoria. Westernport Bay Seabed Investigation

- A list of Co-ordinates is provided at the start of the report. However, the datum is not stated. Given the date of the survey work (1974) it is therefore assumed that the coordinates are relative to the AMG66 datum.
- The historical logs are shown as providing depths to O.D level, though there is no explanation as to what the datum is.
- The logs refer to undisturbed samples as U4s or U2s, with the 4 and 2 referring to the sample diameter in inches.

8.4.6 Aecom, Port of Hastings Stage 1 Development

Base data in Aecom's in-house gINT format was provided to WorleyParsons as an Excel file for incorporation into the AGS data format. The data provided has been transferred to the AGS data template as required.



9. IMPORTANT INFORMATION ON INTERPRETATION, USE AND LIABILITY OF THIS REPORT

This report has been prepared in accordance with a specific brief and scope of work. It should be read in its entirety.

The responsibility of WorleyParsons is solely to the Client. This report is not intended for, and should not be relied upon, by any third party. No liability is undertaken to any third party.

Ground conditions are subject to continuing natural and man-made processes. They can exhibit a variety of properties that vary from place to place, and can change with time. Site investigation involves gathering and assimilating data by means such as inspection, drilling, excavation, probing, sampling and testing. The collected data is only directly relevant to the ground at the place where and the time when the investigation was performed.



10. REFERENCES

- Sully, J.P., and Campanella, R.G. 1994. Evaluation of Field CPTU dissipation data in overconsolidated fine grained soils. Proceedings, 13th International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, New Delhi, pp 201-204.
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- AS1726. 1993. Geotechnical Site Investigations. Standards Australia. 3rd Edition.
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Appendix 1 - Drawings



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Appendix 2 - Grab Sample Logs



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Appendix 3 - Downhole Vane Calibration Certificate



Appendix 4 - Borehole Logs



EXPLANATORY NOTES FOR ROCK DESCRIPTION AND CLASSIFICATION

Geotechnical logging is carried out in general accordance with Australia Standard AS 1726 – 1993 “Geotechnical site investigations”. The terminology used by WorleyParsons to describe the condition of rocks and associated materials for logging purposes is summarized below.

WEATHERING CLASSIFICATION

Term	Symbol	Definition
Residual Soil	RS	Soil derived from the weathering of rock, the mass structure and substance fabric are no longer evident, there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Material	XW	Material is weathered to such an extent that it has “soil” properties i.e. it either disintegrates or can be remoulded in water. Original fabric still evident
Highly Weathered Rock	HW	Rocks is weathered to such an extent that it shows considerable change in appearance and loss in strength. Material is still a rock but of relatively low strength
Moderately Weathered Rock	MW	Rock is weathered to such an extent that it shows a visible change in appearance with significant loss in strength
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh Rock	FR	Rock shows no sign of decomposition or staining

Notes:

1. The term “extremely low” is not used as a rock material strength term. Although it is stated in AS 1726 – 1993 the accompanying field guide clearly states that materials in the strength range are soils in engineering terms.
2. Anisotropy of rock samples may affect field assessment of strength.
3. Uniaxial Compressive Strength (UCS) values are to be stated where tested for project specific correlation with Point Load Strength Index.

CEMENTATION CLASSIFICATION

Term	Symbol	Definition
Uncemented	Uc	Clean grains exhibiting soil properties
Very Weakly Cemented	Vwk	Cement on some grains, collapsing feel under very light finger pressure
Weakly Cemented	Wk	Cement on many grains, collapsing feel under finger pressure, breaks down to individual grains
Moderately Weakly Cemented	Mwk	Cement on most grains, breaks down to lumps under finger pressure, can crush to individual grains under knife blade
Moderately Cemented	Mo	Cement on most grains, can break off by hand and crush to small lumps under knife blade
Well Cemented	We	Practically all grains cemented together, cannot break fragments off by hand, dull sound under hammer
Very Well Cemented	Vwe	Most primary pores filled with cement, requires firm blow with hammer to break off fragments, rings when struck

Notes:

1. The above field classification system uses terms commonly adopted by geotechnical engineering practice in Western Australia.



DEFECT SPACING

Term	Symbol	Definition
Extremely Wide	Ew	More than 6m
Very Wide	Vw	2 to 6m
Wide	W	600mm to 2m
Moderate	M	200 to 600mm
Close	C	60 to 200mm
Very Close	Vc	20 to 60mm
Extremely Close	Ec	Less than 20mm

Notes:

1. Above terms and definitions sourced from ISRM Suggested Methods – 1981 “Rock Characterisation, Testing and Monitoring”.

ROCK MASS WEATHERING

Weathering of the rock mass in relation to the distribution of weathered materials and the effect of defects is described below.

Grade	Description
I	No visible sign of weathering except perhaps staining on defect surfaces
II	Almost all rock is discoloured by slight weathering
III	Less than half of the material is moderately to extremely weathered, some residual boulders/corestones may be present
IV	More than half of the material is moderately to extremely weathered, occasional corestones may be present
V	The material is extremely weathered with mass structure largely intact
VI	Refer to soil classification system

Notes:

1. The above weathering grades apply to relatively large scale exposures. For boreholes, weathering terms discussed previously apply.
2. Defect persistence (areal extent) and aperture (openness) to be recorded where appropriate.

ROCK MASS BLOCK SHAPE

Blocky	Equidimensional
Tabular	Thickness much less than length or width
Columnar	Height much greater than cross section

EXPLANATORY NOTES FOR SOIL DESCRIPTION AND CLASSIFICATION

Geotechnical logging is carried out in general accordance with Australia Standard AS 1726-1993 “Geotechnical site investigations”. The description of soils is based on the Unified Soil Classification system and includes type, plasticity, particle characteristics, colour and minor components. Classification of soils is based on particle size distribution and plasticity, in accordance with Appendix A of AS 1726-1993. The terminology used by WorleyParsons to describe the condition of soils for logging purposes is summarized below. Sheet 2 provides assistance for field description and soil classification.

MOISTURE CONDITION

Term	Symbol	Field Guide
Dry	D	Looks and feels dry. Cohesive soils usually hard, friable or powdery. Granular soils are cohesion less and free running
Moist	M	Feels cool and darkened in colour. Cohesive soils can be moulded by hand. Granular soils tend to cohere
Wet	W	Feels cool darkened in colour. Cohesive soils usually weakened and free water forms on hands when remoulding. Granular soils tend to cohere



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CONSISTENCY OF COHESIVE SOILS

Term	Symbol	Undrained Shear Strength (kPa)	Field Guide
Very Soft	VS	Less than 12	Exudes between fingers when squeezed in hand
Soft	S	12 to 25	Can be moulded by light finger pressure
Firm	F	25 to 50	Can be moulded by strong finger pressure
Stiff	St	50 to 100	Cannot be moulded by fingers, can be indented by thumb
Very Stiff	VSt	100 to 200	Can be indented by thumb nail
Hard	H	More than 200	Can be indented with difficulty by thumb nail

DENSITY OF GRANULAR SOILS

Term	Symbol	Density Index (%)	N Value
Very Loose	VL	Less than 15	0 to 4
Loose	L	15 to 35	4 to 10
Medium Dense	MD	35 to 65	10 to 30
Dense	D	65 to 85	30 to 50
Very Dense	VD	More than 85	More than 50

PLASTICITY OF FINE GRAINED SOILS

Term	Range of Liquid Limit (%)
Low Plasticity	Less than 35
Medium Plasticity	35 to 50
High Plasticity	More than 50

MINOR COMPONENTS

Term	Field Guide	Material Proportion
Trace of	Presences just detectable	Coarse grained soils less than 5% Fine grained soils less than 15%
With some	Presence easily detectable	Coarse grained soils between 5 to 12% Fine grained soils between 15 to 30%

SAMPLE/TEST (FOR LOG SHEETS)

Details of field testing (and samples retrieved) including the following:

SPT	Standard Penetration Test (blows per 150mm and N value), HB – hammer bouncing, RW – rod weight
U63	63mm diameter Thin Walled Tube Sample
HV	Hand Vane Test
HP	Pocket Penetrometer Test
B	Bulk Sample
ES	Environmental Sample
D	Disturbed Sample
PSP	Perth Sand Penetrometer (blows per 150mm)
DCP	Dynamic Cone Penetrometer (blows per 150mm)
G	Geotechnical Sample (as distinct from ES)



KEY TO DEFECT DESCRIPTIVE TERMS USED ON CORED BOREHOLE LOGS

DEFECT DESCRIPTORS

1. Type:

F – Fault
JT – Joint
FL – Foliation
VN – Vein
BP – Bedding
SZ – Shear

2. Dip of fracture surface measured relative to a plan perpendicular to core axis (dip direction to be provided if core orientated)

3. Planarity:

UN – Undulating, wavy surface
PR – Planar, no variation in orientation
ST – Stepped, well defined steps present
IR – Irregular, many changes in orientation
CU – Curved
DIS - Discontinuous

4. Roughness:

SL – Slickensided, visual evidence of striations
S – Smooth, surface appears and feels smooth
RF – Rough, some ridges and angle steps are evident, asperities are clearly visible and surface feels abrasive
VR – Very rough, near right angle steps and ridges occur on the defect surface
POL - Polished

5. Type of Infilling:

Clay – Clay
CA – Calcite
KT – Chlorite
Fe – Iron oxide
Fe Clay – Iron Oxide Clay
Qz – Quartz
X - Carbonaceous
MS – Secondary Mineral
MU – Unknown Mineral

6. Amount of Infilling:

CN – Clean, no visible coating or infilling
SN – Surface Stain, no visible coating or infilling but surfaces are discoloured
VR – Veneer, a visible coating or infilling too thin to measure, may be patchy
CT – Coating, visible coating or infilling up to 1mm thick
FILLED – Filled, coating or infilling greater than 1mm thick with amount in millimetres. Thick soil infilling to be described as seams if boundaries roughly parallel, or crushed seams if composed of rock fragments e.g. brecciated

Notes:

1. Cores with defect spacing's in the range extremely close to close can be collectively denoted as "highly fractured" where considered appropriate
2. NR – not recorded NA – not applicable

HOLE NO : A1r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Anchorage

POSITION : E: 347151.760, N: 5745040.220 (55 MGA94)

SURFACE ELEVATION : -14.770 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 14/7/14

DATE COMPLETED : 14/7/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

[illegible]

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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Consulting**

CORED DRILL HOLE LOG

HOLE NO : A1r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Anchorage

POSITION : E: 347151.760, N: 5745040.220 (55 MGA94)

SURFACE ELEVATION : -14.770 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 14/7/14

DATE COMPLETED : 14/7/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

CASING DIAMETER :

BARREL (Length) : 1.50 m BIT :

BIT CONDITION :

DRILLING				MATERIAL				FRACTURES			
PROGRESS	LOSS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	Weathering	ESTIMATED STRENGTH (s(50))	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA	
DRILLING & CASING	WATER	CORE LOSS DRILL DEPTH RUN %			ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)		Axial Diametral EL -0.03 VL -0.1 L -0.3 M -1 H -3 VH -10 EH	20 40 100 300 1000		(joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other	
			0.0								
			1.0								
			2.0		2.06m START CORING AT 2.06m						
		41% LOSS	2.06		BASALT: dark brown, fine grained, crystalline, fragmented	HW				2.06: Core loss	
			3.0		From 3.0m: change to low strength and orange-brown					JT3 0° PR RF JT 30° Clay VR PR RF JT 0° PR RF JT 20° PR RF	
		3.10m UCS =0.341 MPa 74mm high, 60.8mm diameter 3.20m	3.50		From 3.2m: change to medium strength and dark-brown					3.50: Core loss	
		37% LOSS	3.50								
			4.0		4.00m BASALT: dark grey, fine grained, crystalline, slightly vesicular, iron oxide staining in some joints, clay veneer in some joints, fragmented to highly fractured	MW				4.05: ES pH= 8.43 Highly Fractured	
			5.0							JT 70 - 90° PR RF undulating limonite staining in region JT4 0 - 45° PR RF JT 90° PR RF JT 90° PR RF JT 0° PR RF fragments in region of joints JT25 0 - 30° PR RF	
		0% LOSS	5.00								
			5.75							5.75: ES pH = 8.03	
		60% LOSS	5.75							6.05: Core loss, rapid drilling	
			6.0		6.05m BASALT /SILTY CLAY: brown, fine grained, crystalline, high plasticity (inferred from rate of drilling observed and clay on core). Basalt is residual soil						
			6.50		6.50m BASALT: grey, fine grained, crystalline, slightly vesicular carbonate and limonite infill in vesicles, fractured to slightly fractured	MW				JT 30° PR RF JT 40° PR RF JT 40° PR RF JT 10° Clay VR PR RF JT 10° Clay VR PR RF JT4 20° PR RF JT4 20° PR RF JT4 20° PR RF JT4 20° PR RF	
		0% LOSS	6.50								
		6.90m UCS =2.69 MPa 64mm high, 61.1mm diameter 7.00m	7.0								
			8.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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AGS 3.1 RTA 1.1 UB 06.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ A1RCORE.GDW 15/09/2014 12:30

FINAL Rev 0

File: 301010-01290 A1r 2 OF 3

CORED DRILL HOLE LOG

HOLE NO : A1r

FILE / JOB NO : 301010-01290

SHEET : 3 OF 3

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : Anchorage

POSITION : E: 347151.760, N: 5745040.220 (55 MGA94)

SURFACE ELEVATION : -14.770 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 14/7/14

DATE COMPLETED : 14/7/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

CASING DIAMETER :

BARREL (Length) : 1.50 m BIT :

BIT CONDITION :

DRILLING				MATERIAL				FRACTURES			
DRILLING & CASING	WATER	LOSS (CORE LOSS RUN %)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● Axial ○ Diametral	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
HO CORING		0% LOSS	8.60m UCS = 11.1 MPa 79mm high, 61mm diameter 8.80m	8.0		BASALT: grey, fine grained, crystalline, slightly vesicular carbonate and limonite infill in vesicles, fractured to slightly fractured (continued)	MW				— JT9 0 - 20° PR RF
				8.50m		BASALT: grey, fine grained, crystalline, slightly fractured, carbonate-sealed joints	SW				— JT 45° PR RF
				9.0							— JT 20° PR RF fragmented in region of joints
		9.50		9.50m		BOREHOLE A1r TERMINATED AT 9.50 m					9.50: Borehole backfilled with cement grout
				10.0							
				11.0							
				12.0							
				13.0							
				14.0							
				15.0							
				16.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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AGS 3.1 RTA 1.1 UB 06.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ A1r-2.GDW 15/09/2014 14:29

FINAL Rev 0

File: 301010-01290 A1r 3 OF 3



A1r – 2.06m to 9.50m

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : A2r

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Anchorage

FILE / JOB NO : 301010-01290
SHEET : 1 OF 3

POSITION : E: 347692.480, N: 5744526.030 (55 MGA94) SURFACE ELEVATION : -15.380 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : C Nelson
DATE STARTED : 15/7/14 DATE COMPLETED : 15/7/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>HWT</div><div></div></div>				SPT 7, 11, 12 N=23	0.0		SP	SILICEOUS SAND: Brown, fine to medium grained sand, sub-rounded to sub-angular, with some fine to coarse sand-sized shell fragments, trace shells, trace silt.	W	MD	0.00: ES & G (taken from grab) pH = 8.21		
			0.45m 0.50m								0.50: ES & G pH = 8.20 Windowless sample		
			D										
			1.50m										
				SPT 7, 30/120mm N=R 1.77m	1.50m		CH	GRAVELLY CLAY: Dark brown and grey, high plasticity. Fine to medium grained, angular basalt, dark brown gravel, with stiff grey silty clay matrix.	M	St	1.50: ES & G pH = 8.32 SPT hammer double bouncing		
		2.00m SPT 30/120mm N=R 2.12m			2.12m								
												Continued as Cored Drill Hole	
					3.0								
					4.0								
					5.0								
					6.0								
					7.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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CORED DRILL HOLE LOG

HOLE NO : A2r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Anchorage

POSITION : E: 347692.480, N: 5744526.030 (55 MGA94)

SURFACE ELEVATION : -15.380 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 15/7/14

DATE COMPLETED : 15/7/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

CASING DIAMETER :

BARREL (Length) : 1.50 m BIT :

BIT CONDITION :

DRILLING				MATERIAL				FRACTURES			
PROGRESS	LOSS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	Weathering	ESTIMATED STRENGTH (s(50))	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA	
DRILLING & CASING	WATER	CORE LOSS RUN (%)			(texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)		Axial Diametral EL -0.03 VL -0.1 L -0.3 M -1 H -3 VH -10 EH			(joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other	
			0.0								
			1.0								
			2.0								
			2.12m		START CORING AT 2.12m						
			2.30m		BASALT: red-brown, fine grained, crystalline, slightly fractured, grey clay veneer in joints	EW					
					BASALT: brown, fine grained, crystalline, slightly vesicular, carbonate infill in vesicles, iron oxide staining joints and vesicles, slightly fractured	HW				JT 0° Clay VR PR RF	
					From 2.30m: change to very low strength and brown						
			3.0		From 3.05m: change to very low to low strength					JT 40° weathered to a clay within 30mm of joint	
			3.50m							JT 40° iron oxide stained	
										JT 40° iron oxide stained	
			4.00		BASALT: yellow-brown, fine grained, crystalline, consistency of hard high plasticity clay					4.00: ES	
					From 3.9m: change to extremely low strength and yellow-brown					pH = 8.36	
										JT 40° iron oxide stained	
										JT 40° Clay VR	
										JT 40° Clay VR	
										JT 40° weathered to clay, 50mm thick in region of joint	
			5.0		BASALT: dark brown, fine grained, crystalline, highly fractured	HW				JT 40° iron oxide stained	
			5.30		From 5.0m: change to high strength and dark brown	MW				5.10: ES	
					BASALT: dark grey, fine grained, crystalline, fragmented to highly fractured, iron oxide staining in region of joints	MW				pH = 8.81	
					From 5.3m: change to high to very high strength and dark grey					Core loss	
										JT 40° iron oxide stained	
			6.0							6.10: Core loss	
										6.40: Highly Fractured	
										JT 70° iron oxide stained	
			6.90							6.80: Highly Fractured	
			7.20		BASALT: dark blue-grey, fine grained, crystalline, iron oxide staining in region of some joints, highly fractured	SW				JT 70° undulating	
					From 7.2m: change to dark blue-grey						
					From 7.7m: becoming fractured					JT16 0 - 30° iron oxide stained	
										JT 70 - 90° undulating	
			8.00m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 A2r 2 OF 3

AGS_3_1 RTA_1_1 LIB 06.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS GPJ <<DrawingFile>> 13/09/2014 10:23

FINAL Rev 0

CORED DRILL HOLE LOG

HOLE NO : A2r

FILE / JOB NO : 301010-01290

SHEET : 3 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Anchorage

POSITION : E: 347692.480, N: 5744526.030 (55 MGA94) SURFACE ELEVATION : -15.380 (CD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : C Nelson

DATE STARTED : 15/7/14 DATE COMPLETED : 15/7/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

CASING DIAMETER : BARREL (Length) : 1.50 m BIT : BIT CONDITION :

DRILLING				MATERIAL				FRACTURES			
DRILLING & CASING	WATER	PROGRESS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	Weathering	ESTIMATED STRENGTH (s(50))	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA	
		0% LOSS 8.30	8.0		BASALT: dark blue-grey, fine grained, crystalline, iron oxide staining in region of some joints, highly fractured (continued)	SW				JT 70° Clay VR	
		UCS =19.7 MPa 69mm high, 60.7mm diameter 8.10m	8.30		BOREHOLE A2r TERMINATED AT 8.30 m					8.30: Borehole backfilled with cement grout	
			9.0								
			10.0								
			11.0								
			12.0								
			13.0								
			14.0								
			15.0								
			16.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 A2r 3 OF 3



A2r – 2.12m to 8.30m

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : A3r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Anchorage

POSITION : E: 346940.930, N: 5743794.020 (55 MGA94)

SURFACE ELEVATION : -15.840 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 23/7/14

DATE COMPLETED : 24/7/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
↑						0.0		SP	0.15m SILICEOUS CARBONATE SAND: Orange, brown and white, fine to coarse grained sand, rounded to angular, with some shells up to 20mm in size, trace soft coral and sponge up to 60mm in size. SILTY SAND: Pale grey-olive, fine grained sand, trace white carbonate shell fragments up to 2mm in size.		VL	0.00: ES & G (taken from grab) pH = 8.00
					0.50m SPT 6, 8, 6 N=14						MD	
					0.95m 1.00m SPT 4, 2, 0 N=2	1.0					VL	1.00: ES pH = 7.98
					1.45m 1.50m SPT 3, 4, 5 N=9							
					1.95m	2.0						
					2.50m D						L	2.50: Windowless sample No recovery
					3.50m SPT 2, 3, 3 N=6				From 3.5m: change to grey with trace shells up to 10mm in size			
					3.95m 4.00m SPT 11, 5, 10 N=15	4.0		SM		W		4.00: ES & G pH = 8.26
					4.45m 4.50m SPT 6, 11, 8 N=19						MD	
					4.95m	5.0						
					5.50m SPT 12, 15, 25 N=40							5.50: ES & G pH = 8.31
					5.95m 6.00m SPT 9, 13, 35 N=48	6.0					D	
					6.45m							
					7.50m SPT 5, 4, 7 N=11	7.0					MD	
					7.95m				From 7.8: with some carbonate sand and some shell fragments up to 10mm in diameter			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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HOLE NO : D1

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 348061.210, N: 5763519.510 (55 MGA94)

SURFACE ELEVATION : -9.490 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 23/4/14

DATE COMPLETED : 23/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL									
PROGRESS		DRILLING PENETRATION	GROUND-WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations			
DRILLING & CASING	WATER													
PWT				SPT 5, 3, 4 N=7	0.0		SW- SM	SILICEOUS CARBONATE SAND: Brown, fine to coarse grained sand, with sub-rounded to angular silt, trace fine grained, silica gravel, with some shells up to 20mm in size, with some plant material and soft coral at surface.	W	L	0.00: ES & G (taken using grab) pH = 7.73			
			0.45m	0.50m	SPT 0, 3, 5 N=8		0.45m	SILTY SILICEOUS SAND: Grey, fine to medium grained sand, sub-rounded to sub-angular.						
HWT				0.95m	1.00m		SM	From 1.0m: pale grey	W	L	1.00: U63, no sample recovery			
			U63											
			1.40m	1.50m										
			U63									1.50: U63, no sample recovery		
			1.90m	2.00m										
					SPT 2, 4, 5 N=9	2.0		CI	SILTY CLAY: Pale grey, high plasticity, trace layers of fine grained sand.	M	St			
			2.45m											
			3.00m	3.40m										3.00: U63, no sample recovery
			U63											
				SPT 0, 0, 3 N=3					From 3.5m: pale grey and pale brown mottled, becoming medium plasticity					
				3.95m	4.00m									
				U63	4.0									
				4.45m									4.45: Hand vane (Su) = 120kPa Residual shear = 20kPa	
				5.00m	5.40m									
				U63	5.0									
				5.40m							5.40: Hand vane (Su) = 190kPa Residual shear = 20kPa			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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HOLE NO : D1

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 348061.210, N: 5763519.510 (55 MGA94)

SURFACE ELEVATION : -9.490 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


DATE STARTED : 23/4/14

DATE COMPLETED : 23/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
HWT				SPT 8, 10, 17 N=27	8.0		SM	SILTY SILICEOUS SAND: Pale grey-white, fine to coarse grained sand, sub-rounded to sub-angular. trace fine grained, sub-angular, silica gravel. (continued)	W	MD	10.50: SPT hammer bouncing	
				8.45m	8.40m		SILTY SILICEOUS SAND: Pale brown, fine grained sand.					
				9.00m SPT 14, 14, 9 N=23	9.0							
				9.45m								
				10.50m SPT 11, 17/120mm N=R 10.77m	10.0		SM	From 10.3-10.8m: with trace moderately cemented layers 5-40mm thick				
					11.0					M		MD
					11.50m			SILTY SILICEOUS SAND: Brown and olive mottled, fine to coarse grained sand, rounded to sub-rounded. trace fine grained, rounded, silica gravel.				
				12.00m SPT 3, 32/90mm N=R 12.24m	12.0			SM				
					13.0							
				13.50m SPT 3, 4, 7 N=11	13.50m							
			13.95m	13.95m			BOREHOLE D1 TERMINATED AT 13.95 m					
					14.0							
					15.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
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HOLE NO : D2

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 348425.360, N: 5763213.000 (55 MGA94)

SURFACE ELEVATION : -7.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 21/4/14

DATE COMPLETED : 21/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>PWT</div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></di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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D2

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 348425.360, N: 5763213.000 (55 MGA94)

SURFACE ELEVATION : -7.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 21/4/14

DATE COMPLETED : 21/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
					8.0		CH	SILTY CLAY: Mottled yellow-brown and light grey, high plasticity. trace medium grained silica sand. <i>(continued)</i>		H	penetrometer)		
					8.50m								
					9.00m U63		SC	SILTY SAND: Mottled white grey and yellow-brown, fine to coarse grained sand. fines are low plasticity.		MD	9.40: HP In-situ >600 kPa; (pocket penetrometer)		
					9.40m								
					10.0								
					10.50m U63		CH	SILTY CLAY: Mottled white-grey and yellow-brown, high plasticity. with some medium grained silica sand.		H	10.90: HP In-situ = 400 - 500 kPa; (pocket penetrometer)		
					10.90m								
					11.0								
					11.50m				M				
					12.00m U63		SM	SILTY SILICEOUS SAND: Dark brown, fine to medium grained sand. with trace shell fragments, fines are low plasticity.		D	13.50: Utube refusal after 200mm, no recovery 13.70: SPT hammer double bouncing		
					12.40m								
					13.0								
					13.20m SPT 5, 20/130mm N=R 13.48m								
					13.70m								
					14.0		ML	SANDY SILT: Grey, low plasticity. Fine grained silica sand. weakly cemented, trace shell fragments.		H	14.00: Slow drilling between 14.0-15.0m		
					15.00m SPT 40/130mm N=R 15.13m						15.00: SPT hammer double bouncing		
					15.13m			BOREHOLE D2 TERMINATED AT 15.13 m			15.13: Borehole backfilled with cement grout		

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 1

File: 301010-01290 D2 Page 2 OF 2

HOLE NO : D3

FILE / JOB NO : 301010-01290

FILE / JOB NO. : 3
SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 348693.720, N: 5762982.710 (55 MGA94)

SURFACE ELEVATION : -9.970 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 15/4/14

DATE COMPLETED : 15/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL								
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
PWT				SPT 0, 0, 1 N=1	0.0		SP	0.10m	SILICEOUS CARBONATE SAND: Pale brown, fine to coarse grained sand. sub-rounded to angular, with some silt, with some shells up to 40mm in size.	W	VL	0.00: ES & G (taken from grab) pH = 7.78	
			0.45m 0.50m SPT 0, 4, 9 N=13						SILTY SILICEOUS SAND: Grey, fine to medium grained sand, sub-rounded.		MD		1.00: ES pH = 7.26
			0.95m 1.00m U63	1.0				From 1.0m: pale grey, fine to coarse grained sand					
			1.40m										
			2.00m SPT 15, 13, 21 N=34	2.0			SM						
			2.45m								D		
			3.50m SPT 2, 4, 6 N=10					3.60m					
			3.95m	4.0			CH		SILTY CLAY: Pale grey, high plasticity. with some fine to medium grained sand.	M	St	5.00: ES pH = 7.11	
			5.00m U63	5.0			SC	5.10m	CLAYEY SILICEOUS SAND: Pale grey, fine to coarse grained sand, sub-angular.		D		
			5.40m				SM		SILTY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-angular.	W			
			5.50m SPT 5, 6, 11 N=17					5.50m		CLAYEY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-angular.			
			5.95m	6.0			SC				M	MD	
			7.00m SPT 8, 13, 17 N=30	7.0			SM		6.50m	SILTY SILICEOUS SAND: Pale grey, fine to coarse grained sand, sub-rounded to sub-angular.	W	D	
			7.45m										

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D3

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 348693.720, N: 5762982.710 (55 MGA94)

SURFACE ELEVATION : -9.970 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

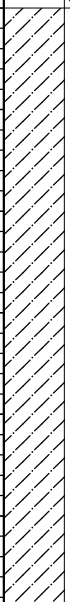

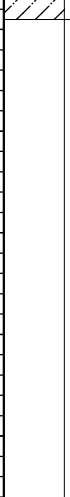
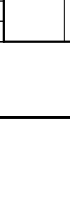
DATE STARTED : 15/4/14

DATE COMPLETED : 15/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>HWT</div><div></div></div>					8.0		SM	SILTY SILICEOUS SAND: Pale grey, fine to coarse grained sand, sub-rounded to sub-angular. <i>(continued)</i>	W	D	8.50: SPT: no sample recovered		
			8.50m SPT 6, 18, 30 N=48										
			8.95m										
					11.0		SM	SILTY SILICEOUS CARBONATE SAND: Grey-olive, fine to medium grained sand, rounded to sub-angular. with some shells up to 10mm in size.	M	D	10.00: ES pH = 7.21		
		11.50m SPT 14, 22, 24 N=46											
		11.95m											
					13.0								
		13.00m SPT 12, 22, 26 N=48											
		13.45m											
					14.0			BOREHOLE D3 TERMINATED AT 13.45 m			13.45: Borehole backfilled with cement grout		
					15.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 1 OF 2

POSITION : E: 348122.150, N: 5762828.530 (55 MGA94) SURFACE ELEVATION : -10.720 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : N Russell
DATE STARTED : 16/4/14 DATE COMPLETED : 16/4/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components		MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D4

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 348122.150, N: 5762828.530 (55 MGA94)

SURFACE ELEVATION : -10.720 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell



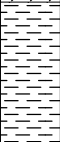

DATE STARTED : 16/4/14

DATE COMPLETED : 16/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
<div>HWT</div> <div>↓</div>						8.0		CI	SANDY CLAY: Pale grey, medium plasticity. Fine to medium grained, sub-angular, silica sand. <i>(continued)</i>	M	St	7.95: Hand vane (Su) = 82kPa Residual shear = 18kPa	
						8.70m							
			9.00m SPT 2, 4, 9 N=13			9.0		SM	SILTY SAND: Pale grey, fine to coarse grained sand, sub-angular to angular.	W	MD		
			9.45m			9.30m		ML	CLAYEY SILT: Dark brown, low plasticity. trace fine to medium grained sand.		St		
						10.0			10.00m	SILTY SAND: Brown, fine to medium grained sand. trace shells up to 5mm in size, weakly cemented.			10.00: ES pH = 7.49
			10.50m U63										
			10.95m 11.00m SPT 12, 16, 34/70mm N=R			11.0		SM		M	VD	11.00: SPT hammer bouncing	
			11.37m										
			12.00m SPT 9, 18, 29 N=47			12.0						D	
			12.45m			12.45m							
								BOREHOLE D4 TERMINATED AT 12.45 m			12.45: Borehole backfilled with cement grout		
						13.0							
						14.0							
						15.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D4 Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D5

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 348486.080, N: 5762515.740 (55 MGA94)

SURFACE ELEVATION : -12.030 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 22/4/14

DATE COMPLETED : 22/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D5 Page 1 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D5

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 348486.080, N: 5762515.740 (55 MGA94)

SURFACE ELEVATION : -12.030 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

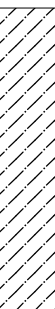
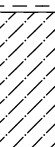
DATE STARTED : 22/4/14

DATE COMPLETED : 22/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div></div></div>				U63	8.0		SM	SILTY SILICEOUS SAND: Dark grey, fine grained sand.	W	MD	
				8.40m							
				9.00m							
				U63							
				9.40m							
				9.50m		9.50m	SANDY SILT: Dark grey, low plasticity. Fine grained sand.	M	H		
				SPT 17, 39, 11/100mm N=R							
				9.90m							
				10.0							
				10.25m							
			10.50m				SM	SILTY SILICEOUS SAND: Dark grey, fine grained sand.	L		
			SPT 2, 4, 4 N=8								
			10.95m		10.95m	BOREHOLE D5 TERMINATED AT 10.95 m				10.95: Borehole backfilled with cement grout	
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D5 Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D6

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347810.140, N: 5762462.690 (55 MGA94)

SURFACE ELEVATION : -11.570 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 19/6/14

DATE COMPLETED : 20/6/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
HWT				SPT 0, 0, 1 N=1	0.0		SP	0.10m SILICEOUS CARBONATE SAND: Orange-brown, fine to coarse grained sand. Sub-rounded to angular . trace silt, with with some shells up to 60mm in size, with trace soft coral.	W	VL	0.00: ES & G (taken from grab) pH = 8.09 SPT sank 420mm under self weight, then 30mm per blow
				0.45m P	0.45m		SC	CLAYEY SILICEOUS SAND: Dark grey, fine grained sand. trace shells.			
				0.90m D	1.0			CLAYEY SAND: Mottled yellow-brown and grey, fine to coarse grained sand. trace seams with weak iron oxide cementation, trace limonite seams up to 5mm thick observed.			0.95: HP In-situ = 350 - 450 kPa; (pocket penetrometer) Hand vane (Su) = 160kPa Residual shear = 20kPa 1.00: Windowless sample from 1.0-2.0m ES & G pH = 7.55
				2.00m U63	2.0		SC	from 2.0m: becoming medium to high plasticity		MD	2.00: Hand vane (Su) = 100kPa Residual Shear = 20kPa
				2.40m							2.40: HP In-situ = 200 - 260 kPa; (pocket penetrometer) Hand vane (Su) = 100kPa Residual shear = 20
				3.50m U63	3.0			SANDY CLAY: Mottled yellow-brown and grey, high plasticity. sand is fine grained silica.			3.50: Silty sand found in top of U-tube
				3.90m	4.0					M	3.90: HP In-situ = 400 - 480 kPa; (pocket penetrometer) Hand vane refusal
				5.00m U63	5.0						
				5.40m			CH			H	5.40: HP In-situ = 420 - 450 kPa; (pocket penetrometer) Hand vane refusal
				6.50m U63	6.0						6.50: Silty sand found in top of U-tube
			6.90m	7.0						6.90: HP In-situ = 400 - 600 kPa; (pocket penetrometer)	
			8.00m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D6 Page 1 OF 2

HOLE NO : D7

FILE / JOB NO : 301010-01290
SHEET : 1 OF 2

POSITION : E: 348183.490, N: 5762159.360 (55 MGA94)		SURFACE ELEVATION : -11.750 (CD)		ANGLE FROM HORIZONTAL : 90°	
RIG TYPE : KL-100		MOUNTING : Barge-Sealift 3		CONTRACTOR : Hagstrom - ABH	
				DRILLER : C Studd	
DATE STARTED : 2/5/14		DATE COMPLETED : 3/5/14		DATE LOGGED :	
				LOGGED BY : L. Missen	
				CHECKED BY : J Hixson	

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D7

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 348183.490, N: 5762159.360 (55 MGA94)

SURFACE ELEVATION : -11.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 2/5/14

DATE COMPLETED : 3/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div></div></div>				8.05m SPT 16, 8, 10 N=18	8.0		SP-SM	Interbedded SAND (SP), SILTY SAND (SM), SILTY CLAY (CL) and SANDY CLAY (CL): Sand is grey, medium dense, fine to coarse grained, sub-angular to sub-rounded silica, medium dense silty sand with fine sub-angular sand, very stiff silty clay is medium plasticity with trace silica sand and very stiff to hard sandy clay is low plasticity, fine grained silica sand with moist clay and wet sand. (continued)	M / W	MD / VS	8.00: Utube refusal after 30mm, no recovery
			8.50m								
			9.50m SPT 7, 9, 11 N=20								
			9.95m	9.80m	SILT (CEMENTED): Brown. with some weakly cemented seams.	M	H	9.80: ES pH = 7.03 9.85: G			
			10.40m SPT 1, 2, 5 N=7	10.30m	SILTY CLAY: Dark brown. trace light grey seams.			10.40: G			
				10.85m 10.90m U63	11.0	CH			Vst		11.30: HP In-situ = 200 - 220 kPa; (pocket penetrometer) Hand vane (Su) = 100kPa Residual shear = 20kPa Borehole backfilled with cement grout
				11.30m	11.30m						
					12.0						
					13.0						
					14.0						
					15.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D8

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347492.850, N: 5762103.280 (55 MGA94)

SURFACE ELEVATION : -12.280 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper











DATE STARTED : 12/2/14

DATE COMPLETED : 12/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>PWT</div>				SPT 1, 5, 8 N=13	0.0		SP	0.15m SILICEOUS CARBONATE SAND: Brown, fine to coarse grained sand, sub-rounded to angular, with some silt, with some shells up to 50mm in size, with trace coral pieces up to 40mm in size.	W	VL	0.00: ES & G (from grab) pH = 7.88	
				0.45m U63	0.50m		CH	SANDY CLAY: Pale grey, high plasticity. Fine to medium grained silica sand.		St		
				0.90m U63	1.00m		SC	CLAYEY SILICEOUS SAND: Pale gray and pale brown mottled, fine to coarse grained sand, sub-rounded to sub-angular.		D		
				1.40m			SC	CLAYEY SILICEOUS SAND: Pale grey and pale brown mottled, fine to coarse grained sand, sub-rounded to sub-angular.	M	MD	1.00: ES pH = 7.16 1.40: Hand vane penetration refusal	
				2.00m U63	2.0		SC	CLAYEY SILICEOUS SAND: Pale grey and pale brown mottled, fine to coarse grained sand, sub-rounded to sub-angular.			2.00: U63 tube penetration refusal after 310mm	
				2.31m SPT 12, 27, 11 N=38	2.76m		SW-SC	SILICEOUS SAND: Pale grey, fine to coarse grained sand, sub-rounded to sub-angular. with some silt.	W	D		
				3.50m U63	3.90m		CI	SILTY CLAY: Pale brown and pale grey mottled, medium plasticity. with some fine grained silica sand.			3.85: ES 3.90: Hand vane (Su) = 228kPa	
				5.00m U63	5.40m		CI	SILTY CLAY: Pale brown and pale grey mottled, medium plasticity. with some fine grained silica sand.	M	H	5.00: ES pH = 6.77 5.40: Hand vane (Su) = 200kPa	
				6.50m U63	6.90m		CH	SILTY CLAY: Pale grey, high plasticity. with some fine to medium grained, sub-angular silica sand.			6.90: Hand vane (Su) = 234kPa	
				8.00m			SC	CLAYEY SILICEOUS SAND: Pale grey, pale brown and blue-grey mottled, fine to coarse grained sand, sub-rounded to sub-angular. with trace fine grained, sub-rounded silica gravel.		MD		

See Explanatory Notes for details of abbreviations & basis of descriptions.

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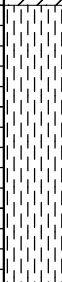
NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 347492.850, N: 5762103.280 (55 MGA94) SURFACE ELEVATION : -12.280 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 12/2/14 DATE COMPLETED : 12/2/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div></div></div>	<div><div></div><div></div><div></div></div>			U63	8.0		SC	CLAYEY SILICEOUS SAND: Pale grey, pale brown and blue-grey mottled, fine to coarse grained sand, sub-rounded to sub-angular. with trace fine grained, sub-rounded silica gravel. (continued)	M	MD	
		8.40m									
					9.0		MH	CLAYEY SILT: Brown, high plasticity. with trace fine grained sand.		VSt	
				9.50m							
				9.90m							
				10.00m							
				U63	10.0						9.90: Hand vane (Su) = 188kPa 10.00: ES pH = 6.83
				10.40m	10.40			BOREHOLE D8 TERMINATED AT 10.40 m			10.40: Hand vane (Su) = 168kPa Borehole backfilled with cement grout
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D8 Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D9

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347875.880, N: 5761790.830 (55 MGA94)

SURFACE ELEVATION : -12.480 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 13/2/14

DATE COMPLETED : 13/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D9 Page 1 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D9

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 347875.880, N: 5761790.830 (55 MGA94) SURFACE ELEVATION : -12.480 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 13/2/14 DATE COMPLETED : 13/2/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 D9 Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D10

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347184.640, N: 5761741.700 (55 MGA94)

SURFACE ELEVATION : -12.850 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 15/2/14

DATE COMPLETED : 17/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D10 Page 1 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D10

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347184.640, N: 5761741.700 (55 MGA94)

SURFACE ELEVATION : -12.850 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper






DATE STARTED : 15/2/14

DATE COMPLETED : 17/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
HWT ↓				U63	8.0		CH	8.20m SANDY CLAY: Dark grey, high plasticity. Fine to coarse grained, sub-rounded silica sand. <i>(continued)</i>	M	Vst	9.50: U63 tube penetration refusal after 150mm 9.60: ES		
			8.40m 8.50m SPT 3, 2, 5 N=7		SM	8.60m SILTY SAND: Dark grey-olive, fine to medium grained sand. with some pockets of weakly to moderately cemented material.	MD						
		8.95m		CI	9.20m SANDY CLAY: Dark grey-olive, medium plasticity. Fine grained sand. with some pockets of weakly to moderately cemented material.	F							
		9.50m U63 9.65m		SM	9.70m SILTY SAND: Dark grey-olive, fine grained sand. weakly cemented, with gravel size pockets of moderately cemented material.	MD							
		SPT 5, 4, 9 N=13		SM	SILTY SAND: Grey, fine grained sand. with trace white carbonate nodules up to 5mm in size.								
		10.10m		BOREHOLE D10 TERMINATED AT 10.10 m									
					11.0						10.10: Borehole backfilled with cement grout		
					12.0								
					13.0								
					14.0								
					15.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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WorleyParsons
Consulting

HOLE NO : D11

FILE / JOB NO : 301010-01290

FILE / JOB NO. : 3
SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 347547.170, N: 5761409.960 (55 MGA94)

SURFACE ELEVATION : -12.580 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 14/2/14

DATE COMPLETED : 14/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL								
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
PWT	HWT			SPT 2, 2, 5 N=7	0.0		SM	SILTY SILICEOUS CARBONATE SAND: Brown, fine to coarse grained sand. sub-rounded to angular, with some shells up to 50mm in size, with trace coral pieces up to 30mm in size.	W	L	0.00: ES & G (from Grab) pH = 7.95		
				0.45m			0.70m						
						SPT 13, 17, 17 N=34	1.03m		SP		D	1.00: U63 tube refusal after 30mm, no sample recovery 1.03: ES & G pH = 7.37	
				1.48m	SPT 7, 10, 8 N=18	1.93m	2.00m						
							2.50m		CH	SILTY CLAY: Pale grey and pale brown mottled, high plasticity. with trace fine grained sand.	H	2.90: Hand vane (Su) = 250kPa	
				2.90m		3.50m							
							4.00m		SM	SILTY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-rounded to sub-angular.	M	MD	4.50: ES pH = 6.88
				4.40m	4.50m	SPT 7, 5, 8 N=13	4.80m						
						4.95m	5.00m		CI	SILTY CLAY: Pale brown and pale grey mottled, medium plasticity. with trace fine to coarse grained, sub-rounded to sub-angular silica sand.	Vst	5.40: Hand vane (Su) = 132kPa	
				5.40m		6.0							
					6.50m		CL	SANDY CLAY: Pale brown and pale grey, high plasticity. Fine to medium grained, sub-rounded to sub-angular silica sand.	H	6.90: Hand vane (Su) = 216kPa			
		6.90m		7.0									
					7.50m								
					8.00m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D11

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 347547.170, N: 5761409.960 (55 MGA94) SURFACE ELEVATION : -12.580 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 14/2/14 DATE COMPLETED : 14/2/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				U63	8.0		CL	SANDY CLAY: Pale brown and pale grey, high plasticity. Fine to medium grained, sub-rounded to sub-angular silica sand. <i>(continued)</i>	M	H	8.40: Hand vane (Su) penetration refusal
				8.40m							
				9.50m							
				U63							
				9.90m							
				SPT 6, 8, 11 N=19	10.0	SM	9.70m	SILTY SILICEOUS SAND: Pale grey and pale brown mottled, fine to medium grained sand, sub-rounded to sub-angular.	MD	9.50: ES	
						SC	10.20m	CLAYEY SILICEOUS SAND: Pale grey and pale brown, fine to medium grained sand, sub-rounded to sub-angular.			
				10.35m	10.35m		10.35m	BOREHOLE D11 TERMINATED AT 10.35 m			10.35: Borehole backfilled with cement grout
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D12

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346860.690, N: 5761369.970 (55 MGA94)

SURFACE ELEVATION : -13.390 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 17/2/14

DATE COMPLETED : 17/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons Consulting

FINAL Rev 0

File: 301010-01290 D12 Page 1 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D12

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 346860.690, N: 5761369.970 (55 MGA94) SURFACE ELEVATION : -13.390 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 17/2/14 DATE COMPLETED : 17/2/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D13

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347225.480, N: 5761050.490 (55 MGA94)

SURFACE ELEVATION : -12.670 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 18/2/14

DATE COMPLETED : 18/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>PWT</div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></di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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D13 Page 1 OF 2

HOLE NO : D13

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 347225.480, N: 5761050.490 (55 MGA94)

SURFACE ELEVATION : -12.670 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper


DATE STARTED: 18/2/14

DATE COMPLETED : 18/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div></div></div>					8.0		SC	CLAYEY SAND: Pale grey, fine to coarse grained sand, sub-angular. (continued)	M	MD	8.40: Hand vane (Su) = 222kPa
			8.50m U63								
			8.90m								
					9.0			9.50m	SILTY CLAY: Brown, high plasticity.	VSI	10.35: ES 10.40: Borehole backfilled with cement grout; Hand vane (Su) = 114kPa
				10.0		CH					
				10.40m U63		10.40m					
				10.40m				BOREHOLE D13 TERMINATED AT 10.40 m			
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

HOLE NO : D14

FILE / JOB NO : 301010-01290

FILE / JOB NO. : 3
SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 346546.220, N: 5760957.770 (55 MGA94)

SURFACE ELEVATION : -12.730 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 11/2/14

DATE COMPLETED : 11/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
PWT				SPT 1, 1, 1 N=2	0.0		SP	SILICEOUS CARBONATE SAND: Brown, fine to coarse grained sand, sub-rounded to sub-angular. with trace silt, with approximately 25% shells up to 50mm in size.	W	VL	0.00: ES & G (from Grab) pH = 7.87
				0.45m			0.60m				
				1.00m U63	1.0		SM	SILTY SILICEOUS SAND: Pale grey, fine to medium grained sand.			1.00: ES pH = 6.63
				1.40m							
				1.50m							
				SPT 3, 2, 5 N=7				SAND: Dark brown and dark grey mottled, fine grained sand. with some silt.		L	
				1.95m	2.0						
							SM		M		
				3.00m SPT 1, 0, 1 N=1	3.0					VL	3.00: ES
				3.45m							
HWT								4.00m			
				4.50m SPT 31, 30/100mm N=R	5.0		SP	SILICEOUS SAND: Pale grey, fine to coarse grained sand, sub-rounded to sub-angular. with trace silt.	W	VD	6.25: ES
				4.75m							
				6.00m SPT 26, 44/150mm N=R	6.0						
				6.30m							
								6.90m			
							SM	SILTY SAND: Dark grey-black, fine grained sand.	M		
				7.50m SPT 11, 8, 9 N=17							
				7.95m				ML	SANDY SILT: Black, low plasticity. Fine grained sand.	VSI	
				8.00m				8.00m			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D14

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 346546.220, N: 5760957.770 (55 MGA94)

SURFACE ELEVATION : -12.730 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 11/2/14

DATE COMPLETED : 11/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D15

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346906.640, N: 5760648.470 (55 MGA94)

SURFACE ELEVATION : -14.080 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 18/1/14

DATE COMPLETED : 20/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D15 Page 1 OF 2

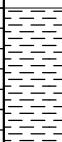

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D15

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 346906.640, N: 5760648.470 (55 MGA94) SURFACE ELEVATION : -14.080 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 18/1/14 DATE COMPLETED : 20/1/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div></div></div>				SPT 4, 1, 3 N=4	8.0		ML	CLAYEY SILT: Dark brown, low plasticity. with some layers of silty clay and fine grained silty sand. (continued)	M	S - F	
			8.45m								
				9.00m U63	9.0		SM	SILTY SAND: Dark brown, fine grained sand. with some layers of weakly cemented material.	W	VL	
			9.45m	9.45m							
								BOREHOLE D15 TERMINATED AT 9.45 m			9.45: Hand vane (Su) = 40kPa Borehole backfilled with cement grout
					10.0						
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D16

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346226.910, N: 5760598.560 (55 MGA94)

SURFACE ELEVATION : -12.460 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 9/1/14

DATE COMPLETED : 10/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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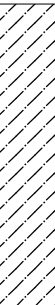

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D16

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 346226.910, N: 5760598.560 (55 MGA94) SURFACE ELEVATION : -12.460 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 9/1/14 DATE COMPLETED : 10/1/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
HWT ↓					8.0		SM	SILTY SILICEOUS SAND: Dark grey to olive, fine to medium grained sand, sub-rounded to sub-angular. trace fine grained gravel.	M	D	8.80: U63 penetration refusal
			8.50m U63								
			8.80m								
					10.00m SPT 6, 7, 9 N=16	9.0		MH	CLAYEY SILT: Dark grey to black, high plasticity. with some bands of moderately cemented material 10-30mm thick.	M	Vst
		10.45m SPT 38, 12, 17 N=29	10.0								
		10.90m	10.90m	10.90m	10.90m	BOREHOLE D16 TERMINATED AT 10.90 m					
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D17

FILE / JOB NO : 301010-01290

SHEET : 1 OF 1

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346589.850, N: 5760279.450 (55 MGA94)

SURFACE ELEVATION : -16.560 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 13/1/14

DATE COMPLETED : 13/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
PWT					0.0		SP	SAND: Pale brown, fine to coarse grained sand, sub-rounded to sub-angular. silica and carbonate, with some shells up to 40mm in diameter.	W	VL	0.00: Windowless sample attempted, no recovery ES pH = 8.03
					0.30m			SILTY SAND: Dark grey, fine grained sand. silica.			
					1.00m						1.00: ES (from U63 tube) pH = 7.3
					1.45m						
					1.90m		SM		W	L	
					2.50m						
					2.95m						
					3.50m						
					4.00m			CLAYEY SAND: Dark grey to black. sand is fine grained, clay is low plasticity.			
					4.45m		SC		M	MD	
					5.00m						
					5.50m		CH	SILTY CLAY: Dark grey to black, high plasticity. trace fine to coarse grained, sub-rounded to sub-angular, silica sand.	M	St	5.95: Hand vane (Su) = 130kPa HP In-situ = 190kPa (pocket penetrometer)
					5.95m						
					6.50m						
					7.00m		SC	CLAYEY SAND: Dark grey, fine grained sand. with some fine grained sand, clay is low plasticity.	M	MD	
					7.45m						7.45: Borehole backfilled with cement grout
								BOREHOLE D17 TERMINATED AT 7.45 m			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D17 Page 1 OF 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D18

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345943.770, N: 5760259.530 (55 MGA94)

SURFACE ELEVATION : -12.510 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 10/2/14

DATE COMPLETED : 10/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components		MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
PWT				SPT 4, 4, 6 N=10	0.0		SW	0.10m	SAND: Brown, fine to coarse grained sand, sub-rounded to sub-angular. silica and carbonate, with some shells up to 30mm in size, with trace coral pieces up to 60mm in size. SANDY CLAY: Pale grey and pale brown mottled, high plasticity. Fine to coarse grained, sub-rounded to sub-angular silica and carbonate sand. with trace shell fragments up to 3mm in size. SILTY CLAY: Pale grey and pale brown, medium plasticity.	W	L	0.00: ES & G pH = 8.14
			0.45m 0.50m U63		CH	0.30m	F					
								St				
HWT					0.90m 1.00m U63		CI					0.90: HP In-situ =150, =250, =250kPa (pocket penetrometer) Hand vane (Su) = 190kPa
					1.40m							1.40: HP In-situ = 260, =260, =340kPa (pocket penetrometer) Hand vane (Su) = 176kPa
					2.0			2.00m	SANDY CLAY: Pale grey and pale brown mottled, medium plasticity. Fine to medium grained, sub-rounded to sub-angular silica sand.		VSt	
					2.50m U63		CI					2.40: ES pH = 7.11
					2.90m							2.90: HP In-situ = 350, =380, =400kPa (pocket penetrometer)
								3.50m	SILTY SAND: Pale grey, fine to medium grained sand.			
					4.00m U63					M		
					4.40m 4.50m SPT 5, 8, 11 N=19		SM				MD	
					4.95m							4.90: ES
					5.50m SPT 4, 6, 10 N=16		CH	5.25m	SANDY CLAY: Dark brown, high plasticity. Fine to coarse grained, sub-rounded silica sand.		St	
					5.95m 6.00m U63			5.80m	SANDY CLAY: Dark brown, high plasticity. Fine grained sand. trace shells up to 2mm in size.			5.90: ES
					6.40m							6.40: HP In-situ = 170, =190, =180, =170kPa (pocket penetrometer) Hand vane (Su) = 150kPa
							CH				VSt	
					7.16m SPT 34, 8, 6 N=14				at 7.16m: 20mm thick horizontal layer of moderately cemented silcrete from 7.3-7.5m: 1mm thick vertical layer of moderately weakly cemented silcrete			7.00: U63 tube refusal after 160mm, no sample recovery
					7.61m							
								8.00m				

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D18 Page 1 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D18

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 345943.770, N: 5760259.530 (55 MGA94)

SURFACE ELEVATION : -12.510 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper


DATE STARTED : 10/2/14

DATE COMPLETED : 10/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div></div></div>				8.50m SPT 39/150mm N=R 8.65m	8.0		SC	CLAYEY SAND: Dark brown, fine to coarse grained sand. with shells up to 2mm in size.	M	MD	8.50: U63 tube refusal after 250mm, no sample recovery SPT attempted (through un-recovered U63 sample)
				9.00m SPT 37, 15, 11 N=26	9.0			at 8.65m: 10mm thick layer of silcrete			
				9.45m				from 9.0-9.2m: pockets of moderately cemented material (approximately 50%)			
				10.00m SPT 11, 6, 8 N=14	10.0			from 9.8m: with some shells up to 6mm in size			
				10.45m	10.45m			BOREHOLE D18 TERMINATED AT 10.45 m			10.40: ES 10.45: Borehole backfilled with cement grout
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D19

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346303.450, N: 5759951.820 (55 MGA94)

SURFACE ELEVATION : -13.480 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 14/1/14

DATE COMPLETED : 15/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components		MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D19 Page 1 OF 2

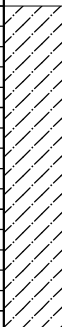

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D19

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 346303.450, N: 5759951.820 (55 MGA94) SURFACE ELEVATION : -13.480 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 14/1/14 DATE COMPLETED : 15/1/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div>HWT</div><div></div></div>	<div><div></div><div></div><div></div></div>			SPT 6, 10, 12 N=22	8.0		SM	SILTY SAND: Pink, pale grey and pale brown mottled, fine grained sand. (continued)	M	MD		
			8.45m									
			9.50m									
			SPT 8, 11, 20 N=31									
					9.60m		SC	SAND: Dark brown, fine to coarse grained sand, sub-angular to angular. silica.			9.50: ES (entire SPT sample) pH = 6.55	
				9.95m	9.95m			BOREHOLE D19 TERMINATED AT 9.95 m				
					10.0							
					11.0							
					12.0							
					13.0							
					14.0							
					15.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D20

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346673.290, N: 5759638.880 (55 MGA94)

SURFACE ELEVATION : -13.790 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 16/1/14

DATE COMPLETED : 17/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>PWT</div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div>HWT</div>				SPT 3, 5, 10 N=15	0.0			SAND: Brown-orange, fine to coarse grained sand, sub-rounded to sub-angular. silica and carbonate with trace silt, with trace shells to 5mm diameter.		VL	0.00: ES from grab sample pH = 7.87	
				0.45m								
				1.00m	SPT 2, 5, 14 N=19	1.0		SP		W	MD	1.00: no sample recovered from SPT
				1.45m								
				1.50m	SPT 3, 5, 9 N=14							1.50: ES using entire SPT pH = 7.79
				1.95m								
				2.00m								
				2.40m	U63			SC			MD	2.40: HP In-situ =275, =180, =220kPa (pocket penetrometer) Hand vane (Su) = 130kPa
				3.00m								
				3.50m	U63							
			3.90m				SC			D	3.90: Hand vane (Su) penetration refusal	
			4.50m									
			5.06m	SPT 45, 5/10mm N=R 5.22m	5.0		SM		M	VD	5.00: U63 tube refusal after 60mm, no sample recovered	
			5.75m									
			6.50m	SPT 7, 12, 11 N=23								
			6.95m				SM			MD		
			8.00m					from 7.5m: sand is fine grained				

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D20 Page 1 OF 2


NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D20

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 346673.290, N: 5759638.880 (55 MGA94) SURFACE ELEVATION : -13.790 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 16/1/14 DATE COMPLETED : 17/1/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div>HWT</div><div></div></div>				SPT 5, 8, 8 N=16	8.0		SM	SILTY SAND: Pink, pale grey and pale brown mottled, fine to medium grained sand, sub-rounded to sub-angular. silica. <i>(continued)</i>	M	MD	9.50: ES (9.5-9.95m)	
			8.45m									
			9.50m SPT 9, 12, 14 N=26									
				9.95m	10.0		9.95m	BOREHOLE D20 TERMINATED AT 9.95 m			9.95: Borehole backfilled with cement grout	
					11.0							
					12.0							
					13.0							
					14.0							
					15.0							
					16.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D21

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346006.700, N: 5759587.880 (55 MGA94)

SURFACE ELEVATION : -15.240 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 15/1/14

DATE COMPLETED : 15/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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FINAL Rev 0

File: 301010-01290 D21 Page 1 OF 2

AGS 3.1 RTA 1.1 UB 06.2 GLB Log RTA NON-CORE DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ <DrawingFile> 13/09/2014 10:09

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D22

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346372.790, N: 5759277.400 (55 MGA94)

SURFACE ELEVATION : -14.900 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 17/1/14

DATE COMPLETED : 18/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
↑	PWT			SPT 5, 24, 27/90mm N=R 0.39m	0.0			SAND: Pale brown, fine to coarse grained sand, sub-rounded to sub-angular. silica and carbonate, with trace shells to 4mm diameter.	W	L	0.00: G and ES taken using grab pH = 8.12		
			1.00m SPT 5, 6, 11 N=17	1.40m	...from 0.75m: dark brown, with trace silt		VD						
	1.45m 1.50m U63	1.70m	SILTY CLAY: Pale grey and pale brown mottled, high plasticity.	MD	1.00: ES from SPT pH = 7.56								
↓	HWT			1.90m	2.0			CLAYEY SAND: Pale grey, fine to medium grained sand, sub-rounded to sub-angular. silica.	M	St	1.50: HP In-situ = 120, =180, =190kPa (pocket penetrometer) Hand vane (Su) = 70kPa		
			3.00m SPT 4, 5, 6 N=11	2.50m	SILTY CLAY: Pale grey and pale brown mottled, medium plasticity. with trace fine to medium grained, sub-angular, silica.	D							
				3.45m 3.50m U63	3.0					St			
				3.90m	4.0				H		3.90: HP In-situ = 200kPa (pocket penetrometer) Hand vane (Su) = 200kPa 4.00: U63 tube refusal after 60mm HP In-situ = 600+ kPa		
				4.56m SPT 11, 11, 16 N=27	4.5		...from 4.5m: with trace pockets of dark brown, moderately cemented ferrocete 5.20m in diameter				4.50: U63 (from 4.50-4.56m) 14.56: ES taken from SPT pH = 6.94		
				5.01m	5.0								
								CLAYEY SILICEOUS SAND: Pale grey, pale brown and pink-red, fine grained sand. fines are medium plasticity.	MD				
				6.00m SPT 9, 6, 9 N=15	6.0								
				6.45m	6.5								
					7.0			CLAYEY SILT: Dark brown, pale grey and pale brown mottled, low plasticity. with trace fine grained sand.	VSt				
				7.50m U63	7.5								
				7.90m 8.00m	8.0						7.90: HP In-situ = 250, =300, =450,		

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

FINAL Rev 0

File: 301010-01290 D22 Page 1 OF 2


NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D22

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 346372.790, N: 5759277.400 (55 MGA94) SURFACE ELEVATION : -14.900 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 17/1/14 DATE COMPLETED : 18/1/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				U63	8.0		ML	CLAYEY SILT: Dark brown, pale grey and pale brown mottled, low plasticity. with trace fine grained sand. (continued)	M	Vst	=600+ kPa (pocket penetrometer) Hand vane (Su) = 140kPa
				8.40m			8.40m	BOREHOLE D22 TERMINATED AT 8.40 m			8.40: HP In-situ =500 - >=600 kPa; (pocket penetrometer) Hand vane (Su) = 180kPa Borehole backfilled with cement grout
					9.0						
					10.0						
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D23

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346011.290, N: 5758859.300 (55 MGA94)

SURFACE ELEVATION : -14.710 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 24/1/14

DATE COMPLETED : 25/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D23 Page 1 OF 2


NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D23

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 346011.290, N: 5758859.300 (55 MGA94) SURFACE ELEVATION : -14.710 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 24/1/14 DATE COMPLETED : 25/1/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div>▼</div></div>				U63	8.0		Cl	SANDY CLAY: Dark grey, dark brown, medium plasticity. with trace fine grained sand. <i>(continued)</i>	M	S . F	7.95: Hand vane (Su) = 46kPa
				8.40m				from 8.5m, brown, with 2-15mm thick layers of dark grey-dark brown, well cemented silcrete			8.40: Hand vane (Su) = 22kPa
				8.50m							8.50: U63 tube, no sample recovery
				P60							Piston sample disturbed pushing through cemented layer
				8.95m							9.00: U63 tube refusal after 100mm, no sample recovered
				9.10m	9.0						
				SPT 16, 7, 25 N=32							
				9.55m			9.55m	BOREHOLE D23 TERMINATED AT 9.55 m			9.50: ES 9.55: Borehole backfilled with cement grout
					10.0						
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D24

FILE / JOB NO : 301010-01290

SHEET : 1 OF 1

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345524.150, N: 5758627.580 (55 MGA94)

SURFACE ELEVATION : -18.530 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 20/1/14

DATE COMPLETED : 21/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D24 Page 1 OF 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D25

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346014.120, N: 5758268.760 (55 MGA94)

SURFACE ELEVATION : -14.490 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 23/1/14

DATE COMPLETED : 23/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
PWT					0.0		SP	0.10m SAND: Brown, fine to coarse grained sand, sub-rounded to sub-angular. silica and carbonate, with trace silt, with trace fine to medium grained, sub-rounded, terricrete gravel, with some shells to 30mm diameter. SANDY CLAY: Pale grey, high plasticity. Fine grained sand.	W	VL	0.00: ES and G collected using grab pH = 7.46	
					0.50m U63		CH					
					0.90m 1.00m U63			1.20m	M	VSI - H	0.90: HP In-situ = 350, =350, =400 kPa; (pocket penetrometer) Hand vane (Su) = 210kPa 1.00: ES from U63 tube pH = 6.93	
					1.40m		CH	SILTY CLAY: Red and pale brown mottled, high plasticity. with trace fine to coarse grained, sub-rounded to sub-angular silica sand.			1.40: HP In-situ = 350, =400, =300 kPa; (pocket penetrometer) Hand vane (Su) = 210kPa	
					2.0			2.00m				
					2.50m U63			SILTY SAND: Pale grey and pale brown-yellow mottled, fine to medium grained sand.				
					2.90m 3.00m SPT 3, 5, 10 N=15		SM		W	MD		
					3.45m			3.70m				
					4.00m SPT 10, 14, 18 N=32			SILTY SAND: Red-pink, pale brown and pale brown mottled, fine grained sand.				
					4.45m 4.50m SPT 10, 20, 18 N=38			from 4.5-4.25m, sand is coarse grained				
					4.95m 5.00m SPT 7, 14, 16 N=30		SM				5.00: ES from combined SPT samples pH = 6.99	
					5.45m 5.50m				M			
					6.0			6.50m				
					7.00m SPT 3, 5, 8 N=13		CL	SILTY CLAY: Dark brown, low plasticity. with some fine grained sand.		St		
					7.45m			7.70m				
					8.00m		CI	SILTY CLAY: Brown, medium plasticity. with trace fine sand, fine grained gravel sized, sub-angular to angular ferricrete.		Vst		

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D25

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 346014.120, N: 5758268.760 (55 MGA94) SURFACE ELEVATION : -14.490 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 23/1/14 DATE COMPLETED : 23/1/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
DRILLING & CASING ↓ HWT				U63	8.0		Cl	SILTY CLAY: Brown, medium plasticity. with trace fine sand, fine grained gravel sized, sub-angular to angular ferricrete. (continued)	M	Vst	
				8.40m			8.40m	BOREHOLE D25 TERMINATED AT 8.40 m			8.35: ES 8.40: HP In-situ = 110, =110, =150 kPa; (pocket penetrometer) Hand vane (Su) = 150kPa Borehole backfilled with cement grout
					9.0						
					10.0						
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D26

FILE / JOB NO : 301010-01290

SHEET : 1 OF 1

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345533.390, N: 5757822.860 (55 MGA94)

SURFACE ELEVATION : -16.200 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 22/1/14

DATE COMPLETED : 22/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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WorleyParsons
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FINAL Rev 0

File: 301010-01290 D26 Page 1 OF 1

HOLE NO : D27r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 346659.240, N: 5758998.760 (55 MGA94)

SURFACE ELEVATION : -12.230 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 30/6/14

DATE COMPLETED : 1/7/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

[illegible]

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D27r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346659.240, N: 5758998.760 (55 MGA94)

SURFACE ELEVATION : -12.230 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 30/6/14

DATE COMPLETED : 1/7/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
HWT					8.0		SC	CLAYEY SAND: Mottled light grey and light brown, fine to coarse grained sand. <i>(continued)</i>	M	MD		penetrometer) Hand vane refusal	
				9.00m U63			8.50m	SANDY CLAY: Mottled yellow-brown and grey, minor black, low plasticity. Fine grained, sub-angular to sub-rounded, silica sand.				9.00: Hand vane (Su) = 120kPa Residual shear = 30kPa	
				9.40m		CL	10.00m	SILTY CLAY: Mottled red-brown, yellow-brown and grey, high plasticity. trace medium grained silica sand, trace weakly cemented iron oxide seams up to 20mm thick.				9.40: HP In-situ = 220 - 340 kPa; (pocket penetrometer) Hand vane (Su) = 120kPa Residual shear = 20kPa	
				10.50m U63		CH	10.90m	BOREHOLE D27r TERMINATED AT 10.90 m				10.90: HP In-situ = 400 - 600 kPa; (pocket penetrometer) Hand vane refusal Borehole backfill with cement grout	
				10.90m	11.0								
					12.0								
					13.0								
					14.0								
					15.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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FINAL Rev 1

File: 301010-01290 D27r Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D30r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346155.830, N: 5761594.190 (55 MGA94)

SURFACE ELEVATION : -11.420 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 21/5/14

DATE COMPLETED : 22/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
PWT	HWT			SPT 0, 1, 0 N=1	0.0		SP	SILICEOUS SAND: Brown, fine to medium grained sand. trace silt.	W	VL	0.00: ES & G (taken from grab) pH = 8.04	
						CL	0.30m	SANDY CLAY: Dark grey, low plasticity. Fine to medium grained, silica sand. with some shell fragments, appears organic.		VS		
				0.45m U63			SP	SILICEOUS SAND: Dark grey, fine to medium grained sand. trace clay, appears organic.		VL	0.50: G (0.5-0.9m) ES (0.5-0.6m)	
					0.90m			SILTY SAND: Dark brown, fine to medium grained sand. appears organic.	L to MD		0.90: HP In-situ = 180 - 230 kPa; (pocket penetrometer) Hand vane (Su) = 30kPa Residual shear = 3kPa	
					1.50m U63						1.50: Hand vane (Su) = 30kPa Residual shear = 5kPa	
					1.90m						1.90: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal	
					2.0		SM		M	MD		
					3.00m U63							
					3.40m 3.50m SPT 1, 1, 4 N=5						3.40: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal 3.50: ES & G	
					3.95m							
					4.0			CLAYEY SAND: Dark brown, fine to medium grained sand. appears organic.				
					4.50m SPT 3, 4, 6 N=10							
					4.95m 5.00m U63							
					5.40m		SC				5.40: Hand vane (Su) = 140kPa Residual shear = 15kPa	
					6.00m U63						6.00: Hand vane (Su) = 120kPa	
					6.40m 6.50m SPT 0, 0, 2 N=2		SC	CLAYEY SILICEOUS SAND: Brown, fine to medium grained sand, rounded to sub-rounded.		MD	6.40: Sand present in base of tube	
					6.95m		CL	SANDY CLAY INTERBEDDED WITH SILTY CLAY (CI): Brown, Sandy clay is low plasticity, very stiff, sand is fine to medium grained, sub-rounded to rounded. Silty clay is medium plasticity, stiff, with trace fine to medium frained sand, with trace clayey sand beds 10-40mm thick.		St / VSt		
					7.0							
								CLAYEY SILT INTERBEDDED WITH SILTY CLAY (CI): Clayey silt is low plasticity and silty clay is medium plasticity, with trace weakly cemented beds up to 200mm thick.	St		7.50: Hand vane (Su) = 50kPa Residual shear = 5kPa	
					7.50m U63		ML					
					7.90m 8.00m			At 7.9m: 100mm thick weakly cemented bed			7.90: HP In-situ = 130 - 160 kPa; (pocket	

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D30r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346155.830, N: 5761594.190 (55 MGA94)

SURFACE ELEVATION : -11.420 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 21/5/14

DATE COMPLETED : 22/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 1

File: 301010-01290 D30r Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D32r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346115.690, N: 5762329.300 (55 MGA94)

SURFACE ELEVATION : -5.360 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

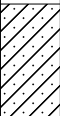
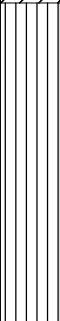
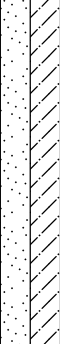

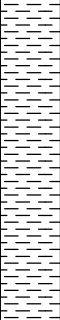
DATE STARTED : 8/5/14

DATE COMPLETED : 8/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
PWT	HWT			P	0.0		SC	CLAYEY SILICEOUS SAND: Dark grey, fine to coarse grained sand. trace shell fragments.	W	VL	0.00: ES & G pH = 7.52 Hand vane (Su) = 2kPa at 0.0m		
		0.40m	P	0.60m	SILTY CLAY: Mottled grey and brown, high plasticity. with some medium grained, sub-angular silty sand.				0.40: Hand vane (Su) = 1kPa 0.4-0.8m: G 0.7-0.8m: ES				
				U63	1.00m		CH		M	H	0.80: HP In-situ = 400-450kPa (pocket penetrometer) Hand vane refusal		
				1.40m	2.0		2.20m				1.40: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal		
				SPT 14, 19, 14 N=33	2.50m		SP- SM	SAND: Light grey, minor brown mottling, fine to medium grained sand, sub-angular to angular. with silt, trace clay and fine grained silica sand beds.	W	D			
				2.95m	3.0		4.00m						
				SPT 30, 30/100mm N=R 4.25m	4.00m					VD			
					5.00m			SILTY SILICEOUS SAND: Brown, fine grained sand.					
				SPT 16, 15, 8 N=23	5.50m		SM			MD	5.50: G		
				5.95m	5.80m		SANDY SILT: Dark brown, low plasticity. Fine grained, rounded sand. appears organic.				5.90: ES		
				U63	7.00m		ML		M	St	7.00: HP In-situ = 140 - 180 kPa; (pocket penetrometer) Hand vane (Su) = 70kPa Residual shear = 5kPa		
				7.40m	8.00m						7.40: HP In-situ = 140 - 200 kPa; (pocket penetrometer) Hand vane (Su) = 60kPa Residual shear = 10kPa		

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D32r Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D32r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346115.690, N: 5762329.300 (55 MGA94)

SURFACE ELEVATION : -5.360 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 8/5/14

DATE COMPLETED : 8/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL				
PROGRESS	DRILLING	GROUND WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
				8.0			SILTY SILICEOUS SAND: Dark brown, fine grained sand, rounded. appears organic.		
			8.50m U			SM			
			8.90m						
				9.0					
				9.50m					
			10.00m U63	10.0		ML	CLAYEY SILT: Dark brown-grey, low plasticity. trace fine grained, silica sand.		10.00: Utube no recovery, grey silt on tube
			10.40m						
			10.50m SPT 1, 1, 0 N=1	10.50m			SANDY CLAY: Brown-grey, medium plasticity. Medium grained, sub-rounded, silica sand.	St	10.50: SPT went 150mm under first blow, and 300mm under second blow Soil is assessed as stiff despite low SPT N value
			10.95m	11.0		CI			
			11.50m U63						11.50: HP In-situ = 150 - 170 kPa; (pocket penetrometer) Hand vane (Su) = 70kPa Residual shear = 30kPa
			11.90m	12.0		CH	SILTY CLAY: Brown-grey, high plasticity. trace weakly cemented silt beds, typically 10mm thick.	M	11.90: HP In-situ = 200 - 220 kPa; (pocket penetrometer) Hand vane (Su) = 100kPa Residual shear = 20kPa
				13.0			300mm thick cemented silt (carbonate) seam		13.00: Utube attempted, refusal after 50mm, no recovery 13.05: SPT double bouncing, cone of SPT damaged, sample collected as SPT may not have gone down the Utube hole 13.06: Rock roller required from 13.06-13.4m 13.40: Easy drilling from 13.4-17.5m
			13.05m SPT 8/10mm N=R 13.06m				SANDY SILT: Dark grey, low plasticity. Fine grained, silica sand. trace shell fragments, trace clay.		
				14.0					
			14.50m U63			ML			14.50: Utube no recovery, grey silt on tube
			14.90m						
			15.00m SPT 30, 40/120mm N=R 15.27m	15.0			From 15.0-16.2m: weakly cemented		15.00: SPT double bouncing, no recovery, cone of SPT damaged
			15.50m SPT 16, 15, 8 N=23						15.50: silt/sand coming up casing
			15.95m 16.00m	16.0					

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D32r

FILE / JOB NO : 301010-01290

SHEET : 3 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346115.690, N: 5762329.300 (55 MGA94)

SURFACE ELEVATION : -5.360 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

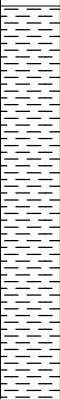
DATE STARTED : 8/5/14

DATE COMPLETED : 8/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
	HWT ↓			SPT 20/50mm N=R 16.05m	16.0		ML	SANDY SILT: Dark grey, low plasticity. Fine grained, silica sand. trace shell fragments, trace clay. <i>(continued)</i>	M	H	16.00: SPT double bouncing, no recovery, cone of SPT damaged	
			17.50m SPT 5, 9, 16 N=25	17.0								
			17.95m	17.95m								
					18.0			BOREHOLE D32r TERMINATED AT 17.95 m			17.95: Borehole backfilled with cement grout	
					19.0							
					20.0							
					21.0							
					22.0							
					23.0							
					24.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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

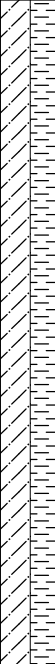
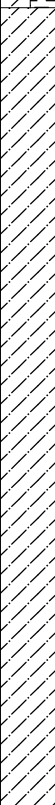
NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D33r

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 1 OF 2

POSITION : E: 346482.800, N: 5762010.140 (55 MGA94) SURFACE ELEVATION : -8.070 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 20/5/14 DATE COMPLETED : 21/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
PWT	HWT			SPT 3, 1, 1 N=2	0.0		SP	SILICEOUS SAND: Brown, fine to medium grained sand, rounded. trace silt.	W	VL	0.00: ES & G (taken from grab) pH = 8.18	
							CH	SILTY CLAY: Dark grey, high plasticity, with some fine grained sand.		VLVS	G (0-0.45m)	
				0.45m U63	0.30m		SC	CLAYEY SILICEOUS SAND: Dark grey, fine to medium grained sand, rounded to sub-rounded.		VLVS	ES (0.2-0.45m)	
				0.90m	0.40m		CL	SANDY CLAY: Mottled light grey and yellow-brown, low plasticity. Medium grained, sub-rounded to rounded, silica sand.		VSL		
				1.50m SPT 5, 2, 3 N=5	0.70m		SP-SM	SAND INTERBEDDED WITH SANDY SILT (ML): Sand is fine to medium grained, sub-angular to angular, predominantly silica sand with silt. Sandy silt is fine grained, silica sand, very stiff, with brown and dark brown silt beds, up to 100mm thick, appears organic.		L		
				1.95m								
				3.00m SPT 20, 35, 15/50mm N=R 3.35m				At 3.35m: 100mm thick weakly cemented silt bed				
					4.00m							
				4.50m SPT 2, 5, 6 N=11	4.00m			SILTY SAND: Dark brown, fine to coarse grained sand. fines are non-plastic to low plasticity, appears organic.	M	MD	4.50: ES & G	
				4.95m U63							4.95: HP In-situ = 350-480kPa (pocket penetrometer) Hand vane refusal 5.00: Sand present at top of tube	
				5.40m							5.40: HP In-situ = 300 - 380 kPa; (pocket penetrometer) Hand vane refusal	
				6.00m U63							6.00: Hand vane (Su) = 40kPa Residual shear = 10kPa	
				6.40m						L	6.40: HP In-situ = 160 - 200 kPa; (pocket penetrometer) Hand vane (Su) = 40kPa Residual shear = 5kPa	
				7.50m SPT 2, 2, 3 N=5							7.50: Soil is assessed as stiff despite low SPT N value	
				7.95m U63								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D33r

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 346482.800, N: 5762010.140 (55 MGA94) SURFACE ELEVATION : -8.070 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 20/5/14 DATE COMPLETED : 21/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div>HWT</div><div></div></div>				U63	8.0		SM	SILTY SAND: Dark brown, fine to coarse grained sand. fines are non-plastic to low plasticity, appears organic. <i>(continued)</i>	M	L	8.00: Hand vane (Su) = 70kPa Residual shear = 15kPa	
			8.40m	10.00m	SANDY CLAY: Dark brown, low plasticity. sand is fine to coarse.						CL	8.40: HP In-situ = 220 - 320 kPa; (pocket penetrometer) Hand vane (Su) = 60kPa Residual shear = 5kPa
			9.00m									
			9.40m									
			10.00m									
			U63	10.50m		CL	10.50: HP In-situ = 280 - 350 kPa; (pocket penetrometer) Hand vane (Su) = 140kPa Residual shear = 30kPa					
			10.90m	11.50m			SILTY CLAY: White-brown, friable, low plasticity. with some weakly cemented silt beds, up to 20mm thick.	CL	10.90: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal			
			12.00m									
			12.30m									
				12.40m		CI	SILTY CLAY: Brown, medium plasticity. trace weakly cemented silt beds, white-brown (carbonate cementing).	St	12.30: Utube refusal after 300mm HP In-situ = 420-550kPa (pocket penetrometer) Hand vane refusal			
			13.0									
			13.50m									
			13.75m									
			14.0									
					ML	CLAYEY SILT: Dark brown, low plasticity. trace sand.	H	15.00: Hand vane (Su) = 140kPa Residual shear = 20kPa				
		15.00m										
		15.40m										
								BOREHOLE D33r TERMINATED AT 15.40 m			15.40: Hand vane refusal Borehole backfilled with cement grout	

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D35r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346429.290, N: 5762700.290 (55 MGA94)

SURFACE ELEVATION : -5.290 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 6/5/14

DATE COMPLETED : 7/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D35r Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D35r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346429.290, N: 5762700.290 (55 MGA94)

SURFACE ELEVATION : -5.290 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 6/5/14

DATE COMPLETED : 7/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					8.0			SILTY SILICEOUS SAND: Dark brown, fine grained sand. appears organic. <i>(continued)</i>	W	MD		
				8.50m SPT 6, 6, 9 N=15			SM					
				8.95m								
					9.0							
								9.50m				
				10.00m SPT 3, 7, 15 N=22	10.0		SM	SILTY SILICEOUS SAND: Dark brown, fine grained sand. with some very stiff silt, with some clay beds.		MD		
				10.45m				10.50m				
								SILTY CLAY: Dark brown, low plasticity. trace fine grained, silica sand, appears organic.			10.50: Drilling rate noticeably faster between 10.5-12.0m then interbedded to 15.0m	
					11.0							
				11.50m U63			CL				11.50: HP In-situ = 420 - 440 kPa; (pocket penetrometer) Hand vane (Su) = 140kPa Residual shear = 10kPa	
				11.90m							11.90: HP In-situ =520 kPa; (pocket penetrometer) HV difficult to push, but low shear strength and residual Hand vane (Su) = 80kPa Residual shear = 4kPa	
					12.0			12.20m	M			
								SANDY SILT: Dark brown. non-plastic, with some white-brown well-cemented sand beds up to 100mm thick.				
				13.00m U63	13.0					H	13.00: Hand vane refusal	
				13.40m							13.40: HP In-situ =420 kPa; (pocket penetrometer) Hand vane refusal	
					14.0		ML					
				14.60m SPT 12, 4, 7 N=11							14.50: Utube attempted, refusal after 100mm, Utube damaged 14.60: HP In-situ = 520kPa (pocket penetrometer) SPT only 5% recovery	
				15.05m	15.0							
								15.50m				
								SILTY CLAY: Dark brown, high plasticity.		VSI		
							CH					
				16.00m	16.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D35r

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 3 OF 3

POSITION : E: 346429.290, N: 5762700.290 (55 MGA94) SURFACE ELEVATION : -5.290 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : C Studd
DATE STARTED : 6/5/14 DATE COMPLETED : 7/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
<div><div></div><div>HWT</div><div></div></div>				U	16.0	<div><div></div><div></div><div></div><div></div><div></div></div>	CH	SILTY CLAY: Dark brown, high plasticity. <i>(continued)</i>	M	VSI		16.40: HP In-situ = 200 - 240 kPa; (pocket penetrometer) Hand vane (Su) = 60kPa Residual shear = 10kPa	
		16.40m		16.50m	SILTY CLAY: Dark grey, medium plasticity. trace silica sand lenses up to 10mm.								
		17.0	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div>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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

HOLE NO : D36r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 346804.090, N: 5762379.810 (55 MGA94)

SURFACE ELEVATION : -9.310 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 19/5/14

DATE COMPLETED : 19/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

[illegible]

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D36r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346804.090, N: 5762379.810 (55 MGA94)

SURFACE ELEVATION : -9.310 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 19/5/14

DATE COMPLETED : 19/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
HWT <											

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 D36r Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D38r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346750.010, N: 5763073.210 (55 MGA94)

SURFACE ELEVATION : -5.080 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 5/5/14

DATE COMPLETED : 5/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 D38r Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D38r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346750.010, N: 5763073.210 (55 MGA94)

SURFACE ELEVATION : -5.080 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 5/5/14

DATE COMPLETED : 5/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0			SILTY SILICEOUS SAND INTERBEDDED WITH SANDY SILT: Mottled brown and grey, fine grained sand, sub-rounded to sub-angular. beds 30mm thick, trace clay. <i>(continued)</i>			
				9.00m SPT 9, 13, 9 N=22	9.0		SM	SILTY SILICEOUS SAND: Dark brown, fine grained sand, sub-rounded. with some hard sandy silt beds, appears organic.	W	MD / H	9.00: ES & G
				9.45m			SM			MD	
				10.50m U63	10.0		CH	SANDY CLAY: Grey, high plasticity. Fine to medium grained, silica and carbonate sand.		H	
				10.90m							10.90: HP In-situ = 400 - 440 kPa; (pocket penetrometer) Hand vane refusal
				12.10m SPT 20/20mm N=R 12.12m	11.0			SILTY CLAY: Grey, with some silt beds up to 100mm thick, typically 0.5-1.0m apart, with fine to coarse silica sand.			
					12.0			cemented bed			12.00: U63 tube refusal after 100mm 12.10: SPT hammer bouncing 12.12: Hand vane (Su) = 100kPa Residual shear = 20kPa
					13.0		CI	cemented bed	M	VSt	
				13.50m SPT 6, 6/100mm, 14/50mm N=R 13.80m				cemented bed			
					14.0			cemented bed			
					15.0			cemented bed			
				15.00m SPT 2, 21, 8 N=29							
				15.45m							
					15.60m		SM	SILTY SAND: Fine to coarse grained sand, sub-angular to angular. trace clay beds 10mm thick, silica, carbonate and other sand minerals.	W	MD	

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0



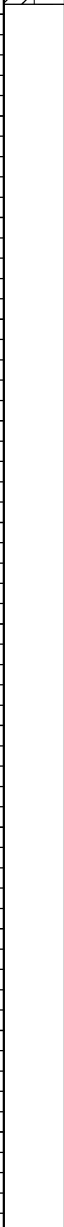
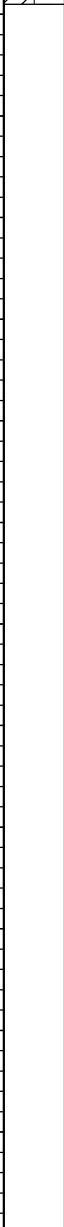
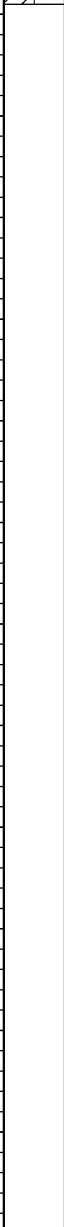
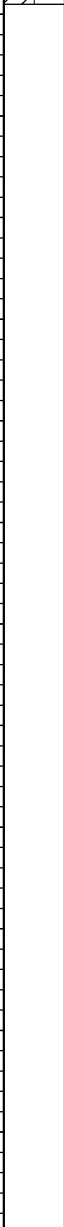
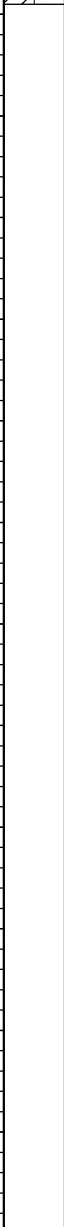
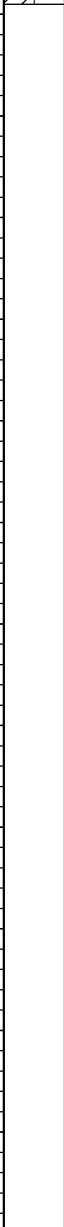
NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D38r

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 3 OF 3

POSITION : E: 346750.010, N: 5763073.210 (55 MGA94) SURFACE ELEVATION : -5.080 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : C Studd
DATE STARTED : 5/5/14 DATE COMPLETED : 5/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div>HWT</div><div></div></div>	<div><div></div><div></div><div></div></div>			16.50m SPT 18, 16, 20 N=36	16.0		SM	SILTY SAND: Fine to coarse grained sand, sub-angular to angular. trace clay beds 10mm thick, silica, carbonate and other sand minerals. <i>(continued)</i>	W	MD		
					16.95m							
					17.0							
					17.20m							
				17.50m SPT 8, 13, 23 N=36	17.0		SM	SILTY SILICEOUS SAND / SANDY SILT (ML): Fine grained sand. trace shell fragments, trace clay.		D / H		
					17.95m							
					18.0							
					17.95m							
					18.0			BOREHOLE D38r TERMINATED AT 17.95 m			17.95: Borehole backfilled with cement grout	
					19.0							
					20.0							
					21.0							
					22.0							
					23.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D38r Page 3 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D39r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347111.580, N: 5762756.520 (55 MGA94)

SURFACE ELEVATION : -8.760 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 17/5/14

DATE COMPLETED : 17/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
PWT ↑				P	0.0		SP CI	0.05m 0.20m	SILICEOUS SAND: Brown, fine to medium grained sand. with shell fragments, trace silt.	W	VSL	0.00: ES & G (taken from grab) pH = 7.77
				SPT 4, 4, 4 N=8	0.45m 0.50m		SM	0.50m	SILTY CLAY: Dark grey, medium plasticity. with fine grained, silica sand, trace shell fragments, semi-liquid. SILTY SILICEOUS SAND: Dark grey, fine to medium grained sand. trace clay, appears organic.		VL	0.40: ES 0.45: Sand present in base of tube
				U63	0.95m 1.00m				SILTY CLAY: Mottled yellow-brown and light grey, high plasticity. trace medium grained sand, fissured, soft wet clayey silt and loose sand in fissures up to 20mm thick, up to 2.5m depth, trace limonite seams to 2mm thick.			
					1.40m 1.50m							1.40: HP In-situ = 400 - 500 kPa; (pocket penetrometer) Hand vane refusal
					1.90m							1.90: HP In-situ = 200 - 300 kPa; (pocket penetrometer) Hand vane (Su) = 140kPa Residual shear = 20kPa
							CH		From 2.5m: with some medium grained silica sand and stiff clay seams		VSt	
					U63	3.00m 3.40m						3.40: HP In-situ = 300 - 400 kPa; (pocket penetrometer) Hand vane (Su) = 140kPa Residual shear = 35kPa HP In-situ = 100kPa (pocket penetrometer) (in stiff clay seam)
					U63	4.50m 4.90m						
							CH	4.70m	SANDY CLAY: Mottled light grey and yellow-brown, high plasticity. Medium grained, angular, silica sand.		H	4.90: HP In-situ = 440 - 490 kPa; (pocket penetrometer) Hand vane refusal
								5.50m	SILTY SAND INTERBEDDED WITH SANDY SILT (ML) AND SANDY CLAY (CL): Dense silty sand, hard sandy silt, hard sandy clay. Mottled red-brown, yellow-brown, light grey.		D/H	
					SPT 7, 21, 20 N=41	6.00m 6.45m		SM			W	
								6.80m	CLAYEY SAND: Mottled light grey and yellow-brown, fine to medium grained sand. with hard, red-brown, low plasticity silt pockets, with trace limonite seams up to 100mm thick.		MD	
				U63	7.50m 7.90m		SC			M		7.90: HP In-situ = 420 - 520 kPa; (pocket

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : D39r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347111.580, N: 5762756.520 (55 MGA94)

SURFACE ELEVATION : -8.760 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 17/5/14

DATE COMPLETED : 17/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
PWT					8.0		SC	CLAYEY SAND: Mottled light grey and yellow-brown, fine to medium grained sand, with hard, red-brown, low plasticity silt pockets, with trace limonite seams up to 100mm thick. (continued)	M	MD	penetrometer) Hand vane refusal
		9.00m U63		At 8.8m: 100mm thick limonite seam (inferred from drilling observations)							
		9.40m									
		10.0									
		10.50m SPT 20, 16, 16 N=32		10.20m	SILTY SILICEOUS SAND: Fine to coarse grained sand, weakly cemented in parts.	D	Vst	9.40: HP In-situ = 400 - 500 kPa; (pocket penetrometer) Hand vane refusal			
		10.95m		11.0	SM						
		12.00m SPT 4, 10, 14 N=24		11.90m	SILTY CLAY: Brown, low plasticity, trace weakly to moderately cemented silt beds, up to 100mm thick, appears organic.						
		12.45m 12.50m U63		12.0	CL						
		12.90m		13.0			At 13.3m: 100mm thick cemented bed		12.00: ES		
		13.50m U63		13.70m					12.90: HP In-situ = 420 - 480 kPa; (pocket penetrometer) Hand vane refusal		
13.90m		13.90m	ML	CLAYEY SILT: Grey, low plasticity, trace fine grained sand, trace shell fragments.							
					14.0		BOREHOLE D39r TERMINATED AT 13.90 m			13.90: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal Borehole backfilled with cement grout	
					15.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 D39r Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G1

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 347979.330, N: 5764993.050 (55 MGA94)

SURFACE ELEVATION : 0.470 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 29/4/14

DATE COMPLETED : 2/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL				
PROGRESS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING									
WATER									
DRILLING PENETRATION									
GROUND WATER LEVELS									
SAMPLES & FIELD TESTS									
	0.0			CLAY: Dark grey, high plasticity. trace fine grained, silica and shell sand, with shells up to 20mm.	W				
	0.45m								
	0.50m								
	0.95m		CH			VS			0.45: Hand vane (Su) = 2kPa
	1.10m								
	1.45m								
	1.50m								
	1.95m			CLAY: Dark grey, mottled grey and pale brown, medium plasticity. trace fine grained, silica and shell sand, some poorly developed fissuring.					0.95: Hand vane (Su) = 7kPa Residual shear = 3kPa 1.00: Downhole Vane (62mm) Torque = 6Nm Residual = 1.5Nm
	2.00m		CI			F			1.95: Hand vane (Su) = 32kPa Residual shear = 8kPa
	2.45m								2.45: Hand vane (Su) = 10kPa Residual shear = 3kPa
	2.70m								
	3.00m			SANDY CLAY: Grey mottled pale brown-yellow, low plasticity. Fine to medium grained, sub-rounded, silica sand.					3.00: Push tube attempted, no recovery.
	3.45m		CL			St			3.45: Hand vane (Su) = 60kPa Residual shear = 16kPa
	4.00m								4.00: Utube no sample recovery
	4.45m				M	VSt			4.45: Hand vane (Su) = 164kPa Residual shear = 32kPa
	4.50m			CLAYEY SILICEOUS SAND: Pale brown, grey and dark grey, fine to medium grained sand, sub-rounded.					
	4.95m								4.95: Too sandy for hand vane test
	6.00m		SC			MD			
	6.45m								
	7.00m			SILICEOUS SAND: Pale brown, fine to medium grained sand, sub-rounded. trace dark mica.					
	7.50m		SP-SM			D			
	7.95m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G1 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G1

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 347979.330, N: 5764993.050 (55 MGA94)

SURFACE ELEVATION : 0.470 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 29/4/14

DATE COMPLETED : 2/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations
					8.0			SILICEOUS SAND: Pale brown, fine to medium grained sand, sub-rounded. trace dark mica. <i>(continued)</i>				
					9.00m		SP-SM					
				SPT 8, 6, 9 N=15	9.0			CLAY: Pale brown and pale grey, high plasticity.				9.00: G
				9.45m								9.10: G
				9.50m								9.45: HP In-situ =510 kPa; (pocket penetrometer) (Cu = 255kPa)
				U63								9.95: Hand vane (Su) = 190kPa Residual shear = 68kPa
					9.95m		CH					
					10.50m							
				U63								
					10.95m							10.95: HP In-situ =350 kPa; (pocket penetrometer) (Cu = 175kPa) Hand vane refusal
					11.0							
					11.50m			CLAY: Pale grey and orange-brown, low plasticity. with fine grained, silica sand.				
					12.00m		CL					
				U63								
					12.45m							12.45: HP In-situ =340 kPa; (pocket penetrometer) (Cu = 170kPa) Hand vane refusal
					13.0							
					13.00m		SP	SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-rounded.				13.50: Utube attempted, but refused after 300mm with no sample recovery. Suspected sand
					14.00m							14.00: G
				SPT 8, 6, 13 N=19	14.0							
					14.45m			CLAYEY SILICEOUS SAND: Brown-olive, fine grained sand. fines are high plasticity.				14.30: G
				14.50m								
				U63								
					14.95m							14.95: Hand vane (Su) = 128kPa Residual shear = 40kPa
				15.00m	15.0		SC	...sand content increasing, with some medium to coarse grained, sub-rounded to rounded sand rich partings				
				SPT 3, 6, 8 N=14								
					15.45m							
					16.0							
					16.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G1

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 347979.330, N: 5764993.050 (55 MGA94)

SURFACE ELEVATION : 0.470 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen



DATE STARTED : 29/4/14

DATE COMPLETED : 2/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					16.0		SM	SILTY SILICEOUS SAND: Olive-brown, fine grained sand. trace fine grained shell fragments to 5mm diameter. ...becoming olive-grey	M	MD	16.95: Utube 300mm recovery, end of tube damaged
				16.50m U63							
				16.95m 17.00m SPT 3, 5, 9 N=14							
				17.45m							
				18.00m SPT 9, 13, 25 N=38							
				18.45m							
				19.0							
				19.50m SPT 12, 16, 25 N=41							
				19.95m							
				20.0							
					20.50m		SP	SILICEOUS SAND: Olive-grey, fine grained sand. with some fine grained carbonate shell fragments to 5mm diameter.	M	VD	
				21.00m SPT 12, 17, 25 N=42							
				21.45m							
				22.0							
				22.50m SPT 7, 15, 22 N=37							
				22.95m							
					23.0						
					24.00m						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G1 Page 3 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G1

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 347979.330, N: 5764993.050 (55 MGA94)

SURFACE ELEVATION : 0.470 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


DATE STARTED : 29/4/14

DATE COMPLETED : 2/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
					SPT 8, 16, 24 N=40	24.0		SP	SILICEOUS SAND: Olive-grey, fine grained sand. with some fine grained carbonate shell fragments to 5mm diameter. <i>(continued)</i>	M	VD	
				24.45m								
				25.50m								
				SPT 6, 13, 23 N=36								
				25.95m								
				27.00m								
				SPT 5, 14, 24 N=38								
				27.45m								
				28.50m								
				SPT 11, 13, 22 N=35								
				28.95m								
				30.00m								
				SPT 4, 10, 20 N=30								
				30.45m								
				31.50m								
				SPT 30/80mm N=R								
				31.58m								
				</								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G1 Page 4 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G1

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 347979.330, N: 5764993.050 (55 MGA94)

SURFACE ELEVATION : 0.470 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


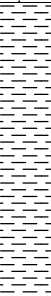
DATE STARTED : 29/4/14

DATE COMPLETED : 2/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING & CASING	WATER	PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER												
							32.0		SP	SILICEOUS SAND: Olive-grey, fine grained sand. with silt, with shell fragments up to 5mm diameter. <i>(continued)</i>		D	
							32.50m						
						33.00m SPT 3, 10, 19 N=29	33.0		ML	SANDY SILT: Olive-grey, low plasticity. Fine grained silica sand. with some shell fragments.			
						33.45m							
							34.0						
						34.50m SPT 4, 13, 30/90mm N=R	34.0			SILT: Grey-olive, low plasticity. trace fine grained, silica sand, with carbonate shell fragments up to 20mm diameter.			
						34.89m							
							35.0			well cemented horizon			35.00: Some hard layers in drill run
						36.00m SPT 3, 10, 19 N=29	36.0						
						36.45m							
							37.0		ML				
						37.50m U63							
						37.95m							
							38.0					H	37.95: HP In-situ =550 kPa; (pocket penetrometer) (Cu = 275kPa) Hand vane refusal
						39.50m U63	39.0						
						39.45m U63							39.45: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal 39.50: Difficult to park tube

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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FINAL Rev 0

File: 301010-01290 G1 Page 5 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G1

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 347979.330, N: 5764993.050 (55 MGA94)

SURFACE ELEVATION : 0.470 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


DATE STARTED : 29/4/14

DATE COMPLETED : 2/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING		WATER										
						40.0		ML	SILT: Grey-olive, low plasticity, trace fine grained, silica sand, with carbonate shell fragments up to 20mm diameter. <i>(continued)</i>		H	
					40.50m SPT 9, 19, 24 N=43	40.60m			SILICEOUS SAND: Grey-green, fine to medium grained sand. medium to coarse shell fragments (pale yellow), trace silt.			40.50: Elect to carry out SPT due to suspected hardness of silt.
					40.95m	41.0						
									...becoming pale brown-green, with weak cement beds up to 50mm thick			41.40: Hard drilling from 41.4m (approx.)
					42.00m SPT 25, 23, 27/120mm N=R	42.0						
					42.42m							
						43.0			...colour returns to grey-green. Cementation no longer evident			
					43.50m SPT 15, 18, 24 N=42							
					43.95m	44.0		SP		M	D	
					45.00m SPT 17, 20, 30 N=50	45.0						
					45.45m							45.72: Hard drilling from base of SPT at 45.72m
						46.0			...colour change to dark green			
					46.50m SPT 34, 20/70mm N=R 46.72m				...suspected cemented zone from 46.7-47.5m			46.50: SPT hammer bouncing
						47.0			...becoming pale brown, with weakly cemented bands			
					48.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G1 Page 6 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G1

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 347979.330, N: 5764993.050 (55 MGA94)

SURFACE ELEVATION : 0.470 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


DATE STARTED : 29/4/14

DATE COMPLETED : 2/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER							Soil Type, Colour, Plasticity or Particle Characteristic	Secondary and Minor Components			
<div><div></div><div>HWT</div><div></div></div>				SPT 30/150mm N=R 48.15m	48.0		SP	SILICEOUS SAND: Grey-green, fine to medium grained sand. medium to coarse shell fragments (pale yellow), trace silt. <i>(continued)</i>	M	D	48.00: SPT hammer bouncing	
				49.50m SPT 25/30mm N=R 49.53m	49.0			...with pockets up to 20mm diameter of black, soft peat			49.75: Borehole backfilled with cement grout	
					49.75m			BOREHOLE G1 TERMINATED AT 49.75 m				
					50.0							
					51.0							
					52.0							
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					100.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G1 Page 7 OF 7

HOLE NO : G2

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : Groundwater

POSITION : E: 349111.310, N: 5764368.500 (55 MGA94)

SURFACE ELEVATION : -2.040 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell/Chris Studd

DATE STARTED : 17/4/14

DATE COMPLETED : 20/4/14

DATE LOGGED :

LOGGED BY : CP/LM

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
PWT				P	0.0			SANDY CLAY: Dark grey, low plasticity. Fine to coarse sand. with shells up to 20mm, seagrass at surface.		VS	0.00: ES & G (taken from grab) pH = 7.96 0.0-0.45 Piston sample, no recover 1.00: SPT penetrated under rod weight
				0.45m P			CL				
				0.95m 1.00m SPT 0, 0, 0 N=0	1.0						
				1.45m				1.70m		MD	
				2.00m SPT 4, 10, 13 N=23	2.0			SILTY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-angular.			
				2.45m 2.50m SPT 11, 14, 18 N=32			SM				
				2.95m	3.0			3.50m			
				4.00m SPT 50/110mm N=R 4.11m	4.0			SILICEOUS SAND: Pale grey, fine to coarse grained sand, rounded to sub-angular. with some silt, trace fine grained, sub0rounded to sub-angular, silica gravel. From 3.5-4.5m: weakly cemented	W		
				5.50m SPT 17, 18, 24 N=42	5.0					D	
				5.95m	6.0						
				7.00m SPT 14, 22, 27 N=49	7.0		SP				
				7.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G2

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 349111.310, N: 5764368.500 (55 MGA94)

SURFACE ELEVATION : -2.040 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell/Chris Studd


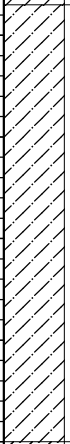
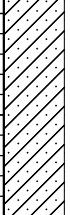


DATE STARTED : 17/4/14

DATE COMPLETED : 20/4/14

DATE LOGGED :

LOGGED BY : CP/LM

CHECKED BY : J Hixson

DRILLING							MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
					SPT 0, 0, 3 N=3	16.0			SILTY SILICEOUS SAND: Dark brown, fine to medium grained sand, sub-rounded to sub-angular. <i>(continued)</i>	W	VL		
				16.45m									
				17.0		SM							L
				17.50m SPT 4, 3, 3 N=6		17.85m			SILTY SILICEOUS SAND: Dark grey, fine to medium grained sand, sub-rounded.				MD
				17.95m		18.0							
				19.00m SPT 6, 7, 9 N=16		19.0		SM					
				19.45m		20.0							
						20.00m			CLAYEY SILICEOUS SAND: Dark grey, fine to medium grained sand.		VL / L		
				20.50m SPT 0, 2, 2 N=4		20.95m				M	VL / L		
						21.0		SC					
						21.50m			SILTY SAND: Dark grey, fine to coarse grained sand. some brown clay beds up to 40mm thick, trace sand sized shell fragments.				L
				22.00m SPT 0, 2, 3 N=5		22.0		SM					
				22.45m 22.50m U63									
				22.70m		22.70m			SILTY CLAY: Grey-brown, low plasticity. with some fined grained silica sand.		H	22.50: HP In-situ =200 kPa; (pocket penetrometer) Hand vane (Su) = 85kPa Residual shear = 16kPa 22.90: HP In-situ =520 kPa; (pocket penetrometer) Hand vane refusal 23.00: Depth of layers inferred based on notable change in drilling rate	
				22.90m		23.0		CH					
				23.40m		23.40m			SILTY CLAY: Grey-brown, high plasticity. with some medium grained silica sand, with some weakly to moderately cemented sand bands up to 300mm thick., trace fine grained, angular mudstone fragments.		VSt	23.50: SPT sank 300mm under rod weight	
				23.50m SPT 0, 0, 21 N=21									
				23.95m				CH	300mm thick cemented bed				

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G2 Page 3 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G2

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 349111.310, N: 5764368.500 (55 MGA94)

SURFACE ELEVATION : -2.040 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell/Chris Studd


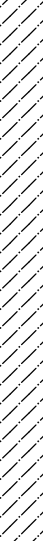

DATE STARTED : 17/4/14

DATE COMPLETED : 20/4/14

DATE LOGGED :

LOGGED BY : CP/LM

CHECKED BY : J Hixson

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					24.0			SILTY CLAY: Grey-brown, high plasticity. with some medium grained silica sand, with some weakly to moderately cemented sand bands up to 300mm thick., trace fine grained, angular mudstone fragments. <i>(continued)</i> 300mm thick cemented bed			24.20: U63 tube refused after 50mm on inferred cemented sand
				25.00m SPT 3, 3, 5 N=8	25.0		CH	From 25.0m: Grey	M	Vst	25.00: SPT, 30% recovery
				25.45m				300mm thick cemented bed			25.50: U63 tube refused after 100mm on inferred cemented sand
					26.0						
				26.50m SPT 4, 5, 15 N=20				SILTY SILICEOUS SAND: Fine to coarse grained sand. with some clayey sand beds between 26.3-27.5m, with some weakly to moderately cemented sand beds typically 0.1m thick at 0.5m intervals, trace sand sized shell fragments.			26.30: Borehole collapsing between 26.3-28.0m
				26.95m	27.0					MD	
				28.00m SPT 12, 20, 26 N=46	28.0		SM		W		
				28.45m						VD	
					29.0						
				29.50m SPT 12, 29, 21/110mm N=R				SILT: Grey, low plasticity. with some fine grained silica sand, trace shell fragments, trace weakly cemented beds 50mm thick to 32.0m depth.			
				29.91m	30.0						
							ML		M	H	
				31.00m SPT 2, 7, 24 N=31	31.0						
				31.45m							
					32.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 G2 Page 4 OF 7

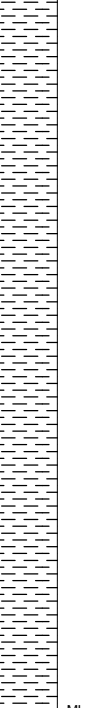

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

FILE / JOB NO : 301010-01290
SHEET : 6 OF 7

POSITION : E: 349111.310, N: 5764368.500 (55 MGA94) SURFACE ELEVATION : -2.040 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : N Russell/Chris Studd
DATE STARTED : 17/4/14 DATE COMPLETED : 20/4/14 DATE LOGGED : LOGGED BY : CP/LM CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 5, 13, 29 N=42	40.0		ML	SILT: Grey, low plasticity. with some clay, trace fine grained, silica sand, trace shell fragments. <i>(continued)</i>	M	H	
				40.45m							
					41.0						
				41.50m SPT 8, 17, 32 N=49							
				41.95m	42.0						
				43.00m SPT 9, 17, 28 N=45	43.0						
				43.45m							
					44.0						
				44.50m SPT 8, 17, 26 N=43							
				44.95m	45.0						
				46.00m SPT 5, 17, 23 N=40	46.0						
				46.45m							
					47.0			SILT: Grey, low plasticity. trace sand, trace beds with some clay, trace shell fragments.			
				47.50m SPT 5, 11, 20 N=31			ML				
				47.95m	48.0						

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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File: 301010-01290 G2 Page 6 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G2

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 349111.310, N: 5764368.500 (55 MGA94)

SURFACE ELEVATION : -2.040 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell/Chris Studd

DATE STARTED : 17/4/14

DATE COMPLETED : 20/4/14

DATE LOGGED :

LOGGED BY : CP/LM

CHECKED BY : J Hixson

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G3

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 350409.160, N: 5764386.830 (55 MGA94)

SURFACE ELEVATION : -2.420 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

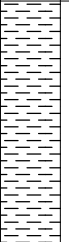
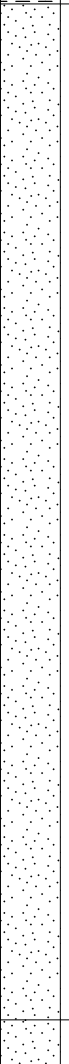
DATE STARTED : 25/4/14

DATE COMPLETED : 28/4/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
↑				SPT 0, 0, 0 N=0	0.0		ML	SANDY SILT: Dark grey, low plasticity. Fine to medium grained, sub-rounded silica sand. and fine grained carbonate shell fragments.	W	VS		
			0.45m									
			1.00m									
				D	1.0		1.20m	Becoming sandy, with shells up to 10mm diameter			1.00: Push tube attempted at 1.0m, no recovery. Windowless sample from 1.0-1.7m split into two samples	
			1.20m	D			SP	SILICEOUS SAND: Dark grey, fine to medium grained sand, sub-rounded. with some silt, trace carbonate shells up to 10mm diameter.	M	D		
			1.70m									
			2.00m									
			SPT 0, 7, 10 N=17									
			2.45m									
			3.00m									
			SPT 9, 13, 17 N=30									
			3.45m									
			4.00m									
			4.50m									
			SPT 9, 14, 17 N=31									
			4.95m									
			5.00m									
			6.00m									
			SPT 14, 21, 29/110mm N=R				6.20m	SILICEOUS SAND: Dark brown, fine to medium grained sand, sub-rounded.				
			6.41m					At 6.2m: 60mm thick horizon of pale brown, medium grained, sub-rounded silica sand, with some shells to 10mm diameter				
			7.00m									
			7.50m									
			SPT 12, 21, 19/90mm N=R									
			7.89m									

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 G3 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G3

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 350409.160, N: 5764386.830 (55 MGA94)

SURFACE ELEVATION : -2.420 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 25/4/14

DATE COMPLETED : 28/4/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING							MATERIAL						
PROGRESS		DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
							8.0			SILICEOUS SAND: Dark brown, fine to medium grained sand, sub-rounded. <i>(continued)</i>			
										Becoming less dark brown from 8.5m			
						9.00m SPT 21, 50/80mm N=R 9.23m	9.0		SP				
							10.0		10.00m	SILICEOUS SAND: Pale brown, medium grained sand, sub-rounded. trace fine grained carbonate shell and mica.			
						10.50m SPT 11, 50/150mm N=R 10.80m							
							11.0		SP				
						12.00m SPT 14, 20, 30/90mm N=R 12.39m	12.0				M	VD	
							13.0		13.00m	SILICEOUS SAND: Dark brown, fine grained sand. with some organic silt.			
						13.50m SPT 10, 17, 33 N=50							
						13.95m							
							14.0						
						15.00m SPT 16, 30/100mm N=R 15.25m	15.0		SP- SM	From 14.5m: becoming fine to medium grained sand			
									16.00m				

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G3

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 350409.160, N: 5764386.830 (55 MGA94)

SURFACE ELEVATION : -2.420 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 25/4/14

DATE COMPLETED : 28/4/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL					
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
					16.0			SILICEOUS SAND: Grey, fine grained sand. with some silt.		
				16.50m SPT 11, 11, 23 N=34			SP		D	
				16.95m	17.0					
								17.50m		
								SILTY SILICEOUS SAND: Grey, fine grained sand. Low plasticity silt.		
				18.00m SPT 5, 10, 9 N=19	18.0					
				18.45m						
					19.0				MD	
				19.50m SPT 8, 8, 13 N=21						
				19.95m	20.0		SM			
				21.00m SPT 9, 15, 15 N=30	21.0				D	
				21.45m						
					22.0					
				22.50m SPT 12, 12, 15 N=27						
				22.95m	23.0				MD	
								23.50m		
								CLAYEY SILICEOUS SAND: Dark grey, fine grained sand.		
							SC		L	
				24.00m	24.0					

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

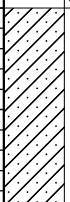
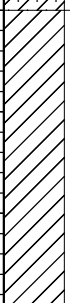
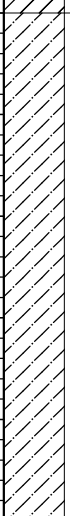
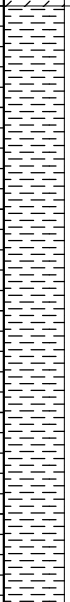
HOLE NO : G3

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 350409.160, N: 5764386.830 (55 MGA94) SURFACE ELEVATION : -2.420 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 25/4/14 DATE COMPLETED : 28/4/14 DATE LOGGED : LOGGED BY : J. Hixson CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 2, 2, 5 N=7	24.0		SC	CLAYEY SILICEOUS SAND: Dark grey, fine grained sand. <i>(continued)</i>	M	L	25.00: Driller notes increase in water pressure, suspected transition to clay at 25.0m 25.95: Hand vane (Su) = 148kPa Residual shear = 32kPa
				24.45m				25.00m			
				25.50m U63	25.0		CI	SANDY CLAY: Dark grey, medium plasticity. Fine grained silica sand.	M	Vst	27.00: Hand vane (Su) = 82kPa Residual shear = 20kPa 27.45: Slight damage to end of Utube on cemented horizon
				25.95m				26.50m			
					26.0			SILTY SILICEOUS SAND: Dark grey and pale brown, fine grained sand. with trace fine grained shell fragments and occasional dark grey laminations, with trace organic material.	M	MD	28.50: Hand vane refusal 28.75: U tube refusal at 28.75m
				27.00m U63	27.0						
				27.45m SPT 16, 12, 8 N=20				At 27.45m: pale brown, cemented sand horizon (weakly cemented) (very low strength, as rock) 150mm thick			
					27.90m		SM		M	Vst	30.15: Hand vane (Su) = 128kPa Residual shear = 16kPa 30.20: Utube refusal after 200mm at 30.2m
				28.50m U63	28.0						
				28.75m SPT 8, 16, 20 N=36			At 27.75m: dark grey weakly cemented horizon				
					29.0			SILT: Dark grey, low plasticity. with trace organics and clay.	M	Vst	31.50: Utube attempted at 31.5m, no recovery after 2 attempts. Flush out to 32m and push SPT
				29.20m							
								At 29.45m: suspected 100mm thick cemented horizon. Noted from drill advance	M	Vst	31.50: Utube attempted at 31.5m, no recovery after 2 attempts. Flush out to 32m and push SPT
								At 29.7m: suspected 50mm thick cemented horizon. Noted from drill advance	M	Vst	31.50: Utube attempted at 31.5m, no recovery after 2 attempts. Flush out to 32m and push SPT
				30.00m U	30.0			At 30.2m: cemented horizon	M	Vst	31.50: Utube attempted at 31.5m, no recovery after 2 attempts. Flush out to 32m and push SPT
				30.20m							
					31.0				M	Vst	31.50: Utube attempted at 31.5m, no recovery after 2 attempts. Flush out to 32m and push SPT
								From 31.5m (approx.): with some fine grained, white shell fragments to 5mm diameter	M	Vst	31.50: Utube attempted at 31.5m, no recovery after 2 attempts. Flush out to 32m and push SPT
				32.00m	32.0				M	Vst	31.50: Utube attempted at 31.5m, no recovery after 2 attempts. Flush out to 32m and push SPT

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G3 Page 4 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G3

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 350409.160, N: 5764386.830 (55 MGA94)

SURFACE ELEVATION : -2.420 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen





DATE STARTED : 25/4/14

DATE COMPLETED : 28/4/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 3, 9, 13 N=22	32.0		ML	SILT: Dark grey, low plasticity. with trace organics and clay. <i>(continued)</i>		Vst	
					32.45m						
					33.00m			SILTY SAND: Grey-olive, fine grained sand. with trace shells up to 10mm in diameter, with trace medium to coarse grained silica sand, and fine grained, rounded, silica gravel.			
				SPT 8, 18, 32 N=50	33.0						
					33.45m						
					34.0		SM			VD	
					34.50m						
				SPT 7, 18, 32/130mm N=R	35.0						
					34.93m						
					35.0						
					35.50m			SILTY SAND: Olive, fine grained sand. with trace shells up to 4mm in diameter.			
					36.00m				M		
				SPT 15, 26, 27 N=53	36.0					D	
					36.45m						
					37.0						
					37.50m					VD	
				SPT 11, 20, 30/140mm N=R	38.0		SM				
					37.94m						
					39.0						
				SPT 10, 20, 26 N=46	39.0					D	
					39.45m						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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
NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

FILE / JOB NO : 301010-01290
SHEET : 7 OF 7

POSITION : E: 350409.160, N: 5764386.830 (55 MGA94) SURFACE ELEVATION : -2.420 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 25/4/14 DATE COMPLETED : 28/4/14 DATE LOGGED : LOGGED BY : J. Hixson CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div>▼</div></div>				SPT 6, 13, 25 N=38	48.0		SM	SILTY SAND: Olive, fine grained sand. with trace shells up to 4mm in diameter. (continued)	M	D	
			48.45m								
				49.50m SPT 9, 20, 30/100mm N=R	49.0					VD	
				49.90m	49.90m			BOREHOLE G3 TERMINATED AT 49.90 m			49.90: Borehole backfilled with cement grout
					50.0						
					51.0						
					52.0						
					53.0						
					54.0						
					55.0						
					56.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G3 Page 7 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G4

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 349271.800, N: 5763613.780 (55 MGA94)

SURFACE ELEVATION : -12.160 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 26/4/14

DATE COMPLETED : 1/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : L. Missen

DRILLING					MATERIAL								
PROGRESS	DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations
					SPT 2, 3, 14 N=17	0.0		SP	0.10m SILICEOUS SAND: Brown, fine grained sand. trace silt, trace shells up to 20mm.	W	L		0.00: ES & G (taken from grab) pH = 7.89
					0.45m 0.50m			CI	0.35m SILTY CLAY: Dark grey, medium plasticity. trace fine grained, silica sand.	M	VS		0-0.45m: G 0.1-0.3m: ES
					SPT 6, 6, 7 N=13			SM	0.50m SILTY SILICEOUS SAND: Dark grey, fine to medium grained sand. with some silt and clay, some well cemented beds up to 20mm thick. SILTY SILICEOUS SAND: White-grey, fine grained sand.	W			0.50: ES & G
					0.95m	1.0		SM					
									1.40m				
					2.00m	2.0		ML	CLAYEY SILT: Dark brown, low plasticity. with some fine grained, silica sand, appears organic.				
					SPT 5, 4, 6 N=10				2.20m				
					2.45m 2.50m				SILTY SILICEOUS SAND: Dark brown, fine to medium grained sand. Low plasticity silt. with some fine grained, silica, non-plastic sand.				
					U63								
					2.90m	3.0		SM		M			2.90: HP In-situ =420 kPa; (pocket penetrometer) Hand vane refusal
					3.50m								
					U63								
					3.90m	4.0							3.90: Hand vane (Su) = 130kPa Residual shear = 18kPa
									4.50m				
					5.00m	5.0		SM	SILTY SAND: Grey, fine grained sand. trace shells up to 2mm in size.				5.00: Utube refusal after 250mm, no sample recovered (5.0-5.25m) 5.0-5.45m: SPT completed, no sample recovered
					SPT 8, 14, 16 N=30								
					5.45m 5.50m								
					SPT 5, 5, 11 N=16								
					5.95m	6.0							
									6.20m				
					6.50m				SILTY SAND: Grey-olive, fine to medium grained sand. trace shells up to 6mm in size.	W			
					SPT 12, 18, 25 N=43								
					6.95m	7.0		SM					
					8.00m	8.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G4 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G4

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 349271.800, N: 5763613.780 (55 MGA94)

SURFACE ELEVATION : -12.160 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 26/4/14

DATE COMPLETED : 1/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : L. Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 4, 8, 23 N=31	8.0			SILTY SAND: Grey-olive, fine to medium grained sand. trace shells up to 6mm in size. <i>(continued)</i>		D	
				8.45m				...from 8.5-10.5m: weakly cemented			
				9.50m SPT 12, 23, 30 N=53	9.0						
				9.95m	10.0		SM		W	VD	
				11.00m SPT 17, 27, 36 N=63	11.0						
				11.45m							
					12.0			12.00m SILTY SILICEOUS CARBONATE SAND: Olive-grey, fine to medium grained sand, sub-rounded. with some shells up to 5mm in size.			
				12.50m SPT 20, 20, 26 N=46					M	D	
				12.95m	13.0						
				14.00m SPT 15, 13/20mm N=R 14.17m	14.0		SM			VD	14.00: SPT hammer bouncing
					15.0			...from 15.0m: fine grained sand	W		
				15.50m SPT 6, 9, 15 N=24						MD	
				15.95m	16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G4 Page 2 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G4

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 349271.800, N: 5763613.780 (55 MGA94) SURFACE ELEVATION : -12.160 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : C Studd
DATE STARTED : 26/4/14 DATE COMPLETED : 1/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : L. Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
PWT					16.0			SILTY SILICEOUS CARBONATE SAND: Olive-grey, fine to medium grained sand, sub-rounded. with some shells up to 5mm in size. <i>(continued)</i>		MD		
					17.0		SM	...from 16.5-18.0m: weakly cemented		VD	17.00: SPT hammer bouncing	
				17.00m SPT 31/80mm N=R 17.08m								
					18.0			18.00m SILTY SILICEOUS CARBONATE SAND: Olive, fine to coarse grained sand, sub-rounded to sub-angular. with some shells up to 10mm in size.		D		
				18.00m SPT 15, 17, 25 N=42								
				18.45m 18.50m								
					19.0		SM	...from 19.5m: sand is fine grained		VD	20.00: SPT hammer bouncing	
				20.00m SPT 13, 25/100mm N=R 20.25m								
					21.0			21.00m SILTY SILICEOUS SAND: Olive-grey, fine grained sand. trace shells up to 50mm in size, silt fraction increasing with depth.		D		
				21.50m SPT 31, 16, 27 N=43								
				21.95m								
					22.0		SM					
				23.00m SPT 9, 20, 30 N=50								
				23.45m								
					24.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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Consulting

FINAL Rev 0

File: 301010-01290 G4 Page 3 OF 7

HOLE NO : G4

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : Groundwater

POSITION : E: 349271.800, N: 5763613.780 (55 MGA94)

SURFACE ELEVATION : -12.160 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd



DATE STARTED : 26/4/14

DATE COMPLETED : 1/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : L Missen

DRILLING							MATERIAL					
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING		WATER										
						24.0		ML	SANDY SILT: Grey, low plasticity. Fine grained silica sand.	W		25.00: Slow drilling (from 25.0-28.0m)
				24.50m SPT 8, 22, 30 N=52								
				24.95m								
					25.0							
				26.00m SPT 11, 19, 23 N=42								
				26.45m								
					27.0							
				27.50m SPT 10, 21, 25 N=46								
				27.95m								
					28.0							
								ML	SILT: Grey, low plasticity. with some fine grained, silica sand, trace clay.	H		
				29.00m SPT 7, 10, 19 N=29								
				29.45m								
					29.0							
					30.0							
				30.50m SPT 8, 17, 28 N=45								
				30.95m								
					31.0							
				32.00m		32.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G4

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 349271.800, N: 5763613.780 (55 MGA94) SURFACE ELEVATION : -12.160 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : C Studd
DATE STARTED : 26/4/14 DATE COMPLETED : 1/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : L. Missen

DRILLING							MATERIAL						
PROGRESS		DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER												
						SPT 7, 16, 31 N=47	32.0			SILT: Grey, low plasticity. with some fine grained, silica sand, trace clay. <i>(continued)</i>			
						32.45m							
							33.0						
						33.50m SPT 4, 10, 22 N=32							33.50: Borehole collapsing and material moving up casing (from 33.5-42.0m)
						33.95m							
							34.0		ML				
							35.0						
						35.00m SPT 9, 15, 23 N=38							
						35.45m							
							36.0						
							36.00m			CLAYEY SILT: Grey, low plasticity. trace fine grained, silica sand, trace shell fragments, with some silt (ML) beds up to 20mm thick.	M	H	
						36.50m SPT 7, 14, 27 N=41							
						36.95m 37.00m U63	37.0						
						37.30m							37.30: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal
							38.0		ML				
						38.00m U63 38.20m							
							39.0						
							39.00m			SILT: Grey, low plasticity. trace fine grained sand, trace shell fragments, with some clayey silt (ML) beds 40mm thick.			
						39.50m SPT 5, 12, 25 N=37			ML				
						39.95m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G4 Page 5 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G4

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

POSITION : E: 349271.800, N: 5763613.780 (55 MGA94)

SURFACE ELEVATION : -12.160 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 26/4/14

DATE COMPLETED : 1/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : L. Missen

DRILLING						MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
						40.0			SILT: Grey, low plasticity. trace fine grained sand, trace shell fragments, with some clayey silt (ML) beds 40mm thick. <i>(continued)</i>			
					41.00m U63	41.0		ML				
					41.40m							41.40: HP In-situ >600 kPa; (pocket penetrometer)
						42.0			CLAYEY SILT: Grey, low plasticity. trace fine grained sand, trace shell fragments.			
					42.50m U63							
					42.90m							42.90: HP In-situ >600 kPa; (pocket penetrometer)
						43.0						
					44.00m U63	44.0				M	H	
					44.40m							44.40: HP In-situ >600 kPa; (pocket penetrometer)
						45.0		ML				
					45.50m U63							
					45.90m							45.90: HP In-situ >600 kPa; (pocket penetrometer)
						46.0						
					47.00m U63	47.0						
					47.40m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 G4 Page 6 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : G4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Groundwater

FILE / JOB NO : 301010-01290
SHEET : 7 OF 7

POSITION : E: 349271.800, N: 5763613.780 (55 MGA94) SURFACE ELEVATION : -12.160 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : C Studd
DATE STARTED : 26/4/14 DATE COMPLETED : 1/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : L. Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div>HWT</div><div></div></div>	<div></div>				48.0		CL	SILTY CLAY: Grey, low plasticity. trace fine grained sand, trace shell fragments.	M	H	48.90: HP In-situ >420 - <500 kPa; (pocket penetrometer)	
					48.50m U63							
					48.90m							
					50.00m U63							
					50.40m		50.40m	BOREHOLE G4 TERMINATED AT 50.40 m			50.40: HP In-situ =420 kPa; (pocket penetrometer) Borehole backfilled with cement grout	
					51.0							
					52.0							
					53.0							
					54.0							
					55.0							
					56.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : N1

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm Channel

POSITION : E: 345438.000, N: 5757628.300 (55 MGA94)

SURFACE ELEVATION : -13.100 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 8/2/14

DATE COMPLETED : 8/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 N1 Page 1 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG


HOLE NO : N1

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm Channel

POSITION : E: 345438.000, N: 5757628.300 (55 MGA94) SURFACE ELEVATION : -13.100 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 8/2/14 DATE COMPLETED : 8/2/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 5, 10, 15 N=25	8.0		ML	SANDY SILT: Grey, low plasticity. Fine grained sand. with some white carbonate nodules and shell fragments up to 3mm in size. <i>(continued)</i>	M	VSI	
				8.45m			8.45m	BOREHOLE N1 TERMINATED AT 8.45 m			8.45: Borehole backfilled with cement grout
					9.0						
					10.0						
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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HOLE NO : N3

FILE / JOB NO : 301010-01290

SHEET : 1 OF 1

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm Channel

POSITION : E: 345535.500, N: 5755003.410 (55 MGA94)

SURFACE ELEVATION : -16.260 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 27/1/14

DATE COMPLETED : 27/1/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
PWT	HWT			SPT 0, 1, 1 N=2	0.0		SP	SAND: Very loose, light grey-brown, fine to medium grained sand. silica sand, trace coarse sand and fine gravel, some shells and shell fragments.	W	VL	0.00: ES taken from Grab pH - 7.73 SPT sank 150mm under self weight
				0.45m 0.50m P60	0.50m						
				1.00m SPT 8, 10, 7 N=17	1.0		CH	SILTY CLAY: Brown, high plasticity. with some medium to coarse, angular to sub-angular gravel sized basalt core stones, basalt gravel dark brown and dark blue-grey, small vesicles.	M	St	0.50: HP In-situ = 120-150kPa (pocket penetrometer) 0.50 - 1.45: ES pH - 6.67 1.00: G taken from SPT
				1.45m	1.70m						
				2.00m SPT 8, 14, 14 N=28	2.0		SP- SM	SAND: Brown, fine to medium grained sand, predominantly silica sand, some silt, trace clay, clay fraction decreasing with depth.	W	MD	2.00: G & ES pH = 6.60
				2.45m 2.50m SPT 10, 40/130mm N=R 2.78m	2.50m			From 2.5-3.4m: becoming very dense interbedded fine and coarse sand beds typically 50mm thick		VD	2.50: double bouncing
				4.00m SPT 11, 18, 8 N=26	4.0				M	MD	4.00: ES & G pH = 6.45 (note mixed sand and clay sample)
				4.45m 4.50m SPT 7, 25, 25 N=50	4.80m						4.50: HP In-situ >600 kPa; (pocket penetrometer)
				4.95m 5.00m SPT 9, 18, 23 N=41	5.0		CI	SILTY CLAY: Light grey, medium plasticity. some remnant rock joints evident, black vaneer in remnant joints.		H	
				5.45m 5.50m U63 5.59m	6.00m						
				6.00m SPT 24, 30/100mm N=50 6.25m SPT 14, 20, 30 N=50	6.0		CH	SILTY CLAY/MUDSTONE: Grey, high plasticity. friable.			6.00: ES pH = 6.80
				6.75m	6.30m			SILTY CLAY: Grey, high plasticity.			6.30: G
				6.75m	6.75m			BOREHOLE N3 TERMINATED AT 6.75 m			6.75: Borehole backfilled with cement grout
					7.0						
					8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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AGS3_1 RTA1_1 LIB06.2.GLB Log RTA NON-CORE DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ <<DrawingFile>> 13/09/2014 10:12

FINAL Rev 0

HOLE NO : N4

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm Channel

POSITION : E: 345120.530, N: 5754162.790 (55 MGA94)

SURFACE ELEVATION : -14.720 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 6/2/14

DATE COMPLETED : 6/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

BOREHOLE N4 TERMINATED AT 7.95 m

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : N5

FILE / JOB NO : 301010-01290

SHEET : 1 OF 1

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm Channel

POSITION : E: 345951.950, N: 5753492.370 (55 MGA94)

SURFACE ELEVATION : -16.350 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 1/2/14

DATE COMPLETED : 3/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING	PENETRATION	GROUND WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING & WATER	PWT	HWT	HO CORING	HWT	SPT 11, 16, 8 N=24	0.0		SW	SILICEOUS SAND: Brown and orange, fine to medium grained sand, sub-rounded, with some fine to coarse grained carbonate shell fragments, with trace silt.	M	VS1- H	0.00: ES (to 0.05m) 0.05: ES (to 0.15m)
					0.45m 0.50m	CH		CLAY: Grey and brown, medium plasticity, with fine to medium grained, angular gravel of dark grey to black, fine grained basalt.	0.50: ES			
					SPT 11, 17, 14 N=31	0.95m 1.00m		CL	GRAVELLY CLAY: Black, red, brown and pale grey, low plasticity. Fine to coarse grained angular basalt gravel.		St	1.50: Run 1. 1.5 - 3.0m TCR = 0.25m SCR = 0m 1.75: G (1.75-2.0m)
					SPT 13, 21, 29/130mm N=R	1.43m 1.50m						
					SPT 22, 30/100mm N=R	1.75m						
					2.00: At 2.0m, change in colour of flush and rate of advance increases							
					3.00m SPT 1, 2, 3 N=5	3.0		CH	SILTY CLAY: Brown, high plasticity, with pale grey inclusions (worm casts) and rare black organic flecks.		St	3.00: ES from 3.0m, end coring and switch back to washboring
					3.45m 3.50m	3.50m						
					U63	3.80m		SP-SM	SILICEOUS SAND: Pale grey, fine to coarse grained sand, sub-rounded, with fine grained gravel, trace silt.		D	3.50: ES U63: sand spilling from tube during examination. Disturbed sample taken
					4.00m SPT 4, 14, 19 N=33	4.45m						
6.00m SPT 16, 28, 22/130mm N=R	6.43m 6.50m	VD	6.00: ES									
SPT 10, 22, 26 N=48	6.95m		6.95: Borehole backfilled with cement grout									
					6.95m	7.0		BOREHOLE N5 TERMINATED AT 6.95 m			6.95: Borehole backfilled with cement grout	

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 N5 Page 1 OF 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : N6

FILE / JOB NO : 301010-01290

SHEET : 1 OF 1

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm Channel

POSITION : E: 346148.830, N: 5752191.290 (55 MGA94)

SURFACE ELEVATION : -16.560 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 19/2/14

DATE COMPLETED : 19/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 N6 Page 1 OF 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : N8

FILE / JOB NO : 301010-01290

SHEET : 1 OF 1

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm Channel

POSITION : E: 346460.280, N: 5751738.190 (55 MGA94)

SURFACE ELEVATION : -16.430 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 20/7/14

DATE COMPLETED : 21/7/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 N8 Page 1 OF 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : N9

FILE / JOB NO : 301010-01290

SHEET : 1 OF 1

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm Channel

POSITION : E: 346895.210, N: 5750151.930 (55 MGA94)

SURFACE ELEVATION : -16.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 21/2/14

DATE COMPLETED : 21/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL							
PROGRESS	DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
					SPT 15, 23, 16 N=39	0.0		SP	SILICEOUS CARBONATE SAND: Brown, fine to medium grained sand. sub-rounded to angular, with trace silt, with trace shells up to 10mm in size.			0.00: ES & G (taken from grab) pH = 8.22 SPT no sample recovered
					0.45m 2.50m				SILICEOUS CARBONATE SAND: Brown, fine to medium grained sand. sub-rounded to angular, with trace silt, with trace shells up to 2mm in size.			0.50: SPT approximately 20g sample recovery
					SPT 21, 50/90mm N=R 0.74m	1.0		SP				1.50: SPT no sample recovered
					1.50m SPT 4, 5, 32 N=37	2.0						2.00: SPT approximately 100g sample recovery
					1.95m 2.50m							
					SPT 8, 2, 2 N=4	2.50m						
					2.45m 2.50m							
					SPT 3, 4, 7 N=11	3.0		SM	CLAYEY SILICEOUS CARBONATE SAND: Grey, fine to medium grained sand, sub-rounded to sub-angular. with some shells up to 10mm in size.			3.00: ES pH = 7.63
					2.95m 3.00m				from 3.0m approximately 30% shells up to 10mm in size			
					SPT 6, 5, 8 N=13	3.20m			SILTY CLAY: Pale grey and brown mottled, high plasticity.			
					3.45m 3.50m							
					U63	4.0		CH				3.90: Hand vane (Su) = 200kPa 4.00: ES pH = 7.12
					3.90m 4.00m U63							4.40: Hand vane (Su) = 182kPa
					4.40m							
						5.0						
					5.50m U63			SC	CLAYEY SILICEOUS SAND: Pale brown and pale grey mottled, fine to coarse grained sand, rounded to sub-angular, high plasticity. fines are medium plasticity.			5.90: Hand vane penetration refusal 6.00: ES pH = 7.05
					5.90m 6.00m U63	6.0			SILTY CLAY: Pale brown and pale grey, medium plasticity.			
					6.40m			CI				6.35: Hand vane (Su) = 260+kPa 6.40: Borehole backfilled with cement grout
									BOREHOLE N9 TERMINATED AT 6.40 m			
						7.0						
						8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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AGS_3_1 RTA_1_1 LUB 06.2 GLB Log RTA NON-CORE DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ <DrawingFile> 13/09/2014 10:12

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : N10

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm Channel

FILE / JOB NO : 301010-01290
SHEET : 1 OF 1

POSITION : E: 346563.030, N: 5750016.690 (55 MGA94) SURFACE ELEVATION : -15.010 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : N Russell
DATE STARTED : 19/7/14 DATE COMPLETED : 20/7/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 N10 Page 1 OF 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : N11r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm Channel

POSITION : E: 345229.790, N: 5753393.090 (55 MGA94)

SURFACE ELEVATION : -12.210 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 5/7/14

DATE COMPLETED : 5/7/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
↑ 											

See Explanatory Notes for details of abbreviations & basis of descriptions.

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HOLE NO : N11r

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SHEET : 2 OF 2

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DRILLING & CASING	WATER										
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R1

FILE / JOB NO : 301010-01290

SHEET : 1 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346775.370, N: 5763999.800 (55 MGA94)

SURFACE ELEVATION : 0.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 3/5/14

DATE COMPLETED : 6/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

FINAL Rev 0

File: 301010-01290 R1 Page 1 OF 8

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R1

FILE / JOB NO : 301010-01290

SHEET : 2 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346775.370, N: 5763999.800 (55 MGA94)

SURFACE ELEVATION : 0.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 3/5/14

DATE COMPLETED : 6/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SC	CLAYEY SAND: Pale grey, fine grained sand, sub-rounded. (continued)			
								8.50m		MD	
							SC	CLAYEY SAND: With pockets (up to 20mm diameter) of fine frained cemented sand, brown.			
				9.00m SPT 3, 5, 7 N=12	9.0			9.10m			9.00: G 9.10: G
				9.45m 9.50m U63			CI	SANDY CLAY: Red-brown, brown and pale grey, medium plasticity.			
								9.70m			
				9.93m				CLAY: Brown, high plasticity. with medium to coarse grained, sub-rounded silica sand.			9.93: HP In-situ =150 kPa; (pocket penetrometer) Su = 75kPa Hand vane refusal due to gravel in tube
				10.50m				At 10.5m: 200mm thick suspected cemented horizon. Tri-cone bit used to penetrate through layer			10.50: Drill advance stopes on cemented layers at 10.5m SPT instructed. SPT hammer bouncing after 0 penetration
					11.0						
							CH			St	
				12.00m U	12.0						
				12.45m							12.45: Hand vane (Su) = 52kPa Residual shear = 8kPa
					13.0						
				13.50m U63				13.70m			13.50: Hand vane (Su) = 60kPa Residual shear = 6kPa
				13.95m			CH	SILT: Brown, high plasticity. with clay.			13.95: Hand vane (Su) = 72kPa Residual shear = 12kPa
					14.0			14.50m			
				15.00m U63	15.0			SILTY CLAY: Dark brown to grey, medium plasticity. with fine grained, silica sand.			
				15.45m			CI			Vst	15.45: Hand vane (Su) = 132kPa Residual shear = 36kPa

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R1

FILE / JOB NO : 301010-01290

SHEET : 3 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346775.370, N: 5763999.800 (55 MGA94)

SURFACE ELEVATION : 0.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 3/5/14

DATE COMPLETED : 6/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING		WATER										
						16.0			SILT: Dark grey, low plasticity. very soft upon remoulding.			
					16.50m P							16.50: Hand vane (Su) = 24kPa U63 attempted but returned empty. Picked up with Piston sampler, 400mm recovery
					16.95m 17.00m U63	17.0		ML		W	S	17.00: U63 sample disturbed due to shear vane 17.10: Downhole vane (62mm) = 500Nm. Possible dubious result as traces of soft silt on blades following retrieval. 17.45: Hand vane (Su) = 22kPa
					17.45m 17.50m U63							
					17.95m 18.00m U63	18.0			18.10m SILT: Dark grey, low plasticity. with some white shell fragments to 5mm diameter.			17.95: Hand vane (Su) = 28kPa Residual shear = 12kPa
					18.45m						Vst	18.45: Hand vane (Su) = 152kPa Residual shear = 40kPa
						19.0			From 19.0m: shell content decreases			
					19.50m U63							
					19.95m	20.0		ML				19.95: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal
					21.00m U63	21.0				M		
					21.45m						H	
						22.0			22.00m SILT: Dark grey, low plasticity. with some white shell fragments to 5mm diameter.			
					22.50m SPT 7, 16, 21/100mm N=R							22.50: SPT hammer bouncing
					22.90m							
						23.0		ML	weakly cemented horizon			
					24.00m	24.0						

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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Consulting

FINAL Rev 0

File: 301010-01290 R1 Page 3 OF 8

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R1

FILE / JOB NO : 301010-01290

SHEET : 4 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346775.370, N: 5763999.800 (55 MGA94)

SURFACE ELEVATION : 0.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen



DATE STARTED : 3/5/14

DATE COMPLETED : 6/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 6, 13, 25 N=38	24.0		ML	SILT: Dark grey, low plasticity. with some white shell fragments to 5mm diameter. (continued)			
				24.45m							
				25.50m							
				SPT 5, 15, 23 N=38							
				25.95m	26.0		MH	26.50m SILT: Dark grey, high plasticity. with some white shell fragments to 5mm diameter.	M	H	26.45: HP In-situ =400 kPa; (pocket penetrometer) Hand vane refusal U63 attempted but tube base damaged, switch to SPT due to hardness of silt
				27.00m							
				SPT 5, 9, 12 N=21	27.0						
				27.45m							
					28.0						
				28.50m							
				U63							
				28.90m	29.0						28.90: HP In-situ >600 kPa; (pocket penetrometer)
					30.0						
				30.00m							
				U63							
				30.40m							30.40: HP In-situ >550 - >600 kPa; (pocket penetrometer)
					31.0						
				31.50m							
				U63							
				31.70m							
				SPT 9, 16, 21 N=37							31.70: HP In-situ >600 kPa; (pocket penetrometer) U63 tube refusal after 200mm
					32.0						

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R1

FILE / JOB NO : 301010-01290

SHEET : 5 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346775.370, N: 5763999.800 (55 MGA94)

SURFACE ELEVATION : 0.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 3/5/14

DATE COMPLETED : 6/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL							
PROGRESS		DRILLING & CASING	WATER	PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER												
							32.0						
						32.15m				SILT: Dark grey, high plasticity. with some white shell fragments to 5mm diameter. <i>(continued)</i>			
						33.00m U63	33.0						
						33.40m							33.40: HP In-situ >600 kPa; (pocket penetrometer)
									MH		M	H	
						34.50m U63							
						34.90m							34.90: HP In-situ >600 kPa; (pocket penetrometer)
							35.0						
						36.00m U63	36.0			36.20m			
						36.33m SPT 23, 6/30mm N=R 36.51m				SILTY CALCAREOUS SAND: Grey-olive, fine to coarse grained sand, sub-angular. with some shell fragments up to 6mm diameter.			36.33: U63 tube refusal after 330mm SPT hammer bouncing
							37.0						
						37.50m SPT 13, 25, 25/100mm N=R							
						37.90m			SM		W	VD	
							38.0			From 38.5m: weakly cemented			
						39.00m SPT 30/140mm N=R 39.14m	39.0						39.00: SPT hammer bouncing
						39.50m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R1

FILE / JOB NO : 301010-01290

SHEET : 6 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346775.370, N: 5763999.800 (55 MGA94)

SURFACE ELEVATION : 0.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 3/5/14

DATE COMPLETED : 6/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL							
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
						40.0			SILTY CALCAREOUS SAND: Grey-olive, fine to coarse grained sand, sub-angular. with some shell fragments up to 6mm diameter. <i>(continued)</i>			
					40.50m SPT 30, 30/90mm N=R 40.74m							
						41.0		SM				
					42.00m SPT 28, 30/100mm N=R 42.25m	42.0				W	VD	
									42.80m			
						43.0			SILTY SILICEOUS SAND: Olive, fine to coarse grained sand, sub-angular.			
					43.50m SPT 35/120mm N=R 43.62m			SM				43.50: SPT hammer bouncing
						44.0			44.20m			
					45.00m SPT 20, 30/80mm N=R 45.23m	45.0		ML	SANDY SILT: Brown-grey, low plasticity. Fine grained sand. trace black wood fragments up to 30mm in size.		H	
					45.50m D				45.50m			45.50: Material recovered on advancing shoe. Small disturbed sample (approx. 150g). Casing advance recovered pockets of brown, amorphous peat on shoe
						46.0		OL	SILT: Dark brown, low plasticity. Organic silt (peat) with black organic flecks.		St - VSt	
					46.00m				46.00m	M		46.50: U63 tube refusal after 220mm PP and HV refusal
					46.50m U63 46.72m							
						47.0		CL	CLAY: Pale grey, low plasticity. with regular sub vertical laminations up to 3mm thick of dark grey to black clay, material is fissile.		H	
					48.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R1

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 7 OF 8

POSITION : E: 346775.370, N: 5763999.800 (55 MGA94) SURFACE ELEVATION : 0.550 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 3/5/14 DATE COMPLETED : 6/5/14 DATE LOGGED : LOGGED BY : J. Hixson CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div>HWT</div><div></div></div>				SPT 30/90mm N=R 48.09m	48.0		CL	CLAY: Pale grey, low plasticity, with regular sub vertical laminations up to 3mm thick of dark grey to black clay, material is fissile. (continued)	M	H	48.00: SPT hammer bouncing after 90mm	
					49.0			BASALT: dark grey, fine grained, crystalline, extremely weathered - highly weathered		VD	49.00: From 49.0m: hard drilling, clay and sandstone gravel recovered from shoe.	
				49.50m				49.50m				
					50.0			Continued as Cored Drill Hole				
					51.0							
					52.0							
					53.0							
					54.0							
					55.0							
					56.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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CORED DRILL HOLE LOG

HOLE NO : R1

FILE / JOB NO : 301010-01290

SHEET : 8 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346775.370, N: 5763999.800 (55 MGA94)

SURFACE ELEVATION : 0.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 3/5/14

DATE COMPLETED : 6/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

CASING DIAMETER :

BARREL (Length) :

BIT :

BIT CONDITION :

DRILLING				MATERIAL				FRACTURES										
PROGRESS		CORE LOSS (CORE LOSS RUN %)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH (s(50))							NATURAL FRACTURE (mm)		VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
DRILLING & CASING	WATER							EL	VL	L	M	H	VH	EH	20	40		
				48.0														
				49.0														
			49.50m			49.50m START CORING AT 49.50m												
↑ HQ CORING ↓		10% LOSS	SPT 30/70mm N=R 49.57m			BASALT: dark grey, fine grained, crystalline, highly fractured into 20-50mm fragments, jointing is very close, non systematic, some foliation of mineral grains evident	HW									49.57: SPT hammer bouncing		
				50.0			SW											
			50.50			50.50m										50.50: Borehole backfilled with cement grout		
						BOREHOLE R1 TERMINATED AT 50.50 m												
				51.0														
				52.0														
				53.0														
				54.0														
				55.0														
				56.0														

See Explanatory Notes for details of abbreviations & basis of descriptions.

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AGS_3_1 RTA_1_1 UB 08.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ <<DrawingFile>> 15/09/2014 12:28

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R1 – 49.5m to 50.5m

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R2

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347034.400, N: 5763770.700 (55 MGA94)

SURFACE ELEVATION : -1.640 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

















DATE STARTED : 1/2/14

DATE COMPLETED : 3/2/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 0, 0, 0 N=0	0.0			SILTY CLAY: Dark grey, medium plasticity. trace fine grained sand, rootlets, trace shell fragments.	W	VS	0.00: ES & G pH = 6.56 SPT sand 150mm under the rods then sank a further 500mm under the weight of the hammer
				0.45m				with some shell fragments			
				1.00m D	1.0		CI			St	1.00: ES & G pH = 7.25 HP In-situ = 120-200kPa; (pocket penetrometer, in windowless sample)
				2.00m U63	2.0			Low plasticity below 2.0m.			
				2.40m			CL				2.40: HP In-situ = 350 - 450 kPa; (pocket penetrometer) Hand vane refusal
				3.00m U63	3.0			SILTY CLAY: Light grey, medium plasticity. occasional soft, dark grey infill in fissures, some light grey silt lenses, some fine grained silica sand. Sand content decreasing with depth.		Vst	3.00: HP In-situ =200 kPa; (pocket penetrometer) HP In-situ = 20kPa; (pocket penetrometer, in soft seam) 2 x Hand vane (Su) = 36kPa
				3.40m							
					4.0		CI	with some grey stiff seams			
				4.50m U63					M		4.50: HP In-situ =300 kPa; (pocket penetrometer) HP In-situ = 150kPa; (pocket penetrometer, in soft seam) Hand vane (Su) = 92kPa
				4.90m							
					5.0						
											
				6.00m U63	6.0		CH	SILTY CLAY: Mottled red-brown, yellow-brown and grey, high plasticity. some limonite staining, trace limonite nodules up to 10mm noted, high plasticity, sand content increasing with depth.			6.00: ES Hand vane refusal HP In-situ = 600+kPa; (pocket penetrometer)
				6.40m							
					7.0					H	
											
				7.50m U63			CL	SANDY CLAY: Mottled red-brown, yellow-brown and grey, low plasticity. Silica sand.			7.50: HP In-situ >600 kPa; (pocket penetrometer)
				7.90m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R2

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347034.400, N: 5763770.700 (55 MGA94)

SURFACE ELEVATION : -1.640 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 1/2/14

DATE COMPLETED : 3/2/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		CL	SANDY CLAY: Mottled red-brown, yellow-brown and grey, low plasticity. Silica sand. <i>(continued)</i>		H	
								8.50m			
				9.00m SPT 12, 20, 22 N=42	9.0		SC	CLAYEY SAND: Mottled red-brown, yellow-brown and grey. fine grained silica sand. Clay fraction decreasing with depth.	M	D	9.00: ES
				9.45m							
					10.0			10.00m			
				10.50m SPT 21, 38, 12/30mm N=R 10.83m				SILTY SAND: Silt and clay fraction increasing with depth.			
					11.0		SM	from 11.5m some clayey sand beds up to 100mm thick	W	VD	
				12.00m SPT 15, 25, 25/100mm N=R 12.40m	12.0						
					13.0			13.00m			
				13.50m SPT 9, 11, 12 N=23			SC	SILTY SAND: Mottled red-brown yellow-brown and grey, fine to medium grained sand.		MD	13.50: HP In-situ =300 kPa; (pocket penetrometer)
				13.95m	14.0						
								14.50m	M		
				15.00m SPT 3, 4, 8 N=12	15.0		SC	CLAYEY SILICEOUS SAND: Dark grey, fine to coarse grained sand.		MD	15.00: HP In-situ =200 kPa; (pocket penetrometer)
				15.45m 15.50m U63							15.50: HP In-situ = 200 - 250 kPa; (pocket penetrometer)
				15.90m							

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R2

FILE / JOB NO : 301010-01290

SHEET : 3 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347034.400, N: 5763770.700 (55 MGA94)

SURFACE ELEVATION : -1.640 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 1/2/14

DATE COMPLETED : 3/2/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					16.0			CLAYEY SILICEOUS SAND: Dark grey, fine to coarse grained sand. <i>(continued)</i>		MD		
				16.50m U63			16.70m				16.50: HP In-situ = 250 - 350 kPa; (pocket penetrometer) Hand vane (Su) = 170kPa	
				16.90m				SILTY CLAY: Grey-brown, low plasticity. some fine grained black sand, trace fine to coarse grained carbonate sand.	M	Vst	16.80: ES	
				18.00m U63								18.50: HP In-situ = 200 - 300 kPa; (pocket penetrometer)
				18.33m								
				18.50m SPT 8, 3, 6 N=9								
				18.95m								
				19.50m U63								19.50: HP In-situ = 200 - 350 kPa; (pocket penetrometer) 4 x Hand vane (Su) = 90-170kPa
				19.80m								
							19.80m			BOREHOLE R2 TERMINATED AT 19.80 m		
					20.0							
					21.0							
					22.0							
					23.0							
					24.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R3

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347388.400, N: 5763455.900 (55 MGA94)

SURFACE ELEVATION : -5.010 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 7/1/14

DATE COMPLETED : 8/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 R3 Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R3

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347388.400, N: 5763455.900 (55 MGA94)

SURFACE ELEVATION : -5.010 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

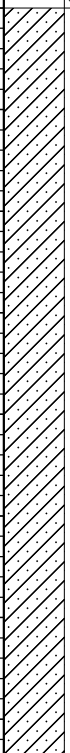
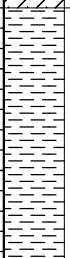

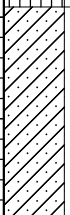
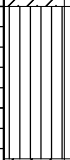

DATE STARTED : 7/1/14

DATE COMPLETED : 8/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SC	CLAYEY SILICEOUS SAND: Dark brown, fine grained sand.	M	VL	10.50: U63 recovery = 450mm 11.00: ES
			9.00m SPT 0, 0, 0 N=0								
			9.45m								
			10.50m U63								
			11.00m SPT 4, 5, 8 N=13								
			11.45m		11.70m			SANDY SILT: Dark brown, low plasticity. Fine grained, sub-angular silica sand.			
			12.00m SPT 0, 3, 4 N=7		12.0		ML			St	
			12.45m								
					13.0		CH	SANDY CLAY: Dark grey to brown, high plasticity. sand is sub-rounded medium to coarse grained silica.			13.50: U63 recovery = 430mm; Hand vane (Su) = 96 kPa
			13.50m U63								
			14.00m SPT 1, 5, 6 N=11		14.0		SC	CLAYEY SAND: Dark grey to brown, medium to coarse grained sand, sub-rounded.			
			14.45m								
			15.00m SPT 0, 1, 0 N=1		15.0		CH	SANDY CLAY: Brown, high plasticity. Fine to medium grained, sub-rounded silica sand. with fine to medium gravel of weakly cemented sand.			15.00: ES Soil is assessed as Firm despite low SPT N value
			15.45m U63								
			15.50m								
			16.00m		16.0		SC	SANDY CLAY: Dark grey, medium plasticity. Fine grained silica sand.	M	VSt	

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R3

FILE / JOB NO : 301010-01290

SHEET : 3 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347388.400, N: 5763455.900 (55 MGA94)

SURFACE ELEVATION : -5.010 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


DATE STARTED : 7/1/14

DATE COMPLETED : 8/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div></div></div>					16.0		SC	SANDY CLAY: Dark grey, medium plasticity. Fine grained silica sand. <i>(continued)</i>	M	Vst	16.00: Hand vane (Su) = 160 kPa
			16.50m SPT 2, 13/100mm N=R 16.75m				cemented sand cobble			16.50: Hammer bouncing	
			17.00m SPT 2, 6, 12 N=18	17.0		17.00m	SILTY SILICEOUS SAND: Dark grey, fine to coarse grained sand, sub-rounded. trace clay, weakly cemented in part.				
			17.45m								
			18.00m SPT 2, 6, 17 N=23	18.0		SM		M	MD		
			18.45m								
			19.0			19.00m	SILTY SILICEOUS SAND: Grey, fine grained sand, sub-angular. with some fine gravel sized carbonate shell fragments and shells up to 10mm.				
			19.50m SPT 3, 7, 14 N=21						MD		
			19.95m	20.0							
			21.00m SPT 15, 35/76mm N=R 21.23m	21.0		SM	weakly cemented layer	M	VD		
		22.50m SPT 7, 19, 29 N=48	22.0						D		
		22.95m	22.95m				22.95m	BOREHOLE R3 TERMINATED AT 22.95 m			22.95: Borehole backfilled to surface with cement grout

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 R3 Page 3 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R4

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346279.480, N: 5763789.260 (55 MGA94)

SURFACE ELEVATION : 1.130 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 25/4/14

DATE COMPLETED : 25/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>PWT</div>				SPT 0, 0, 0 N=0	0.0		SP	SILICEOUS CARBONATE SAND: Brown, fine to coarse grained sand, rounded to sub-angular. with some silt, trace fine grained, sub-rounded, silica gravel.	W	VL	0.00: ES & G (taken from grab) pH = 7.76 SPT sank 450mm under rod weight, no sample recovery <	

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R4 Page 1 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R4

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346279.480, N: 5763789.260 (55 MGA94)

SURFACE ELEVATION : 1.130 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd



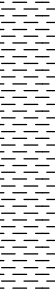
DATE STARTED : 25/4/14

DATE COMPLETED : 25/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL								
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>HWT</div><div></div></div>					8.0		SC	CLAYEY SILICEOUS SAND: Grey-olive, fine to coarse grained sand, sub-angular. <i>(continued)</i>	M	MD	Residual shear = 10kPa		
			8.56m SPT 17, 5, 5 N=10		from 8.4-8.65m: 250mm thick layer of moderately cemented pale green silty fine grained sand			8.50: U63 tube refused after 60mm					
			9.01m			9.0							
								9.50m					
			10.01m SPT 6, 3, 13 N=16			10.0		ML		SANDY SILT: Grey-olive, low plasticity. Fine grained sand. trace pockets of moderately weakly to well cemented material.	St	10.00: U63 tube refused after 10mm	
			10.46m										
						11.0				11.00m			
			11.50m SPT 3, 7, 10 N=17							SANDY SILT: Grey-olive, low plasticity. Fine grained sand. trace shells up to 2mm in size.			
			11.95m			12.0							
		13.00m SPT 4, 9, 15 N=24			13.0		ML		St to VSt				
		13.45m											
					14.0								
		14.55m SPT 6, 11, 15 N=26											
		15.00m			15.0			15.00m			15.00: Borehole backfilled with cement grout		
								BOREHOLE R4 TERMINATED AT 15.00 m					

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 R4 Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R5

FILE / JOB NO : 301010-01290

SHEET : 1 OF 4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346723.040, N: 5763399.340 (55 MGA94)

SURFACE ELEVATION : -2.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 9/1/14

DATE COMPLETED : 10/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R5 Page 1 OF 4

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R5

FILE / JOB NO : 301010-01290

SHEET : 2 OF 4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346723.040, N: 5763399.340 (55 MGA94)

SURFACE ELEVATION : -2.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen



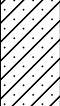
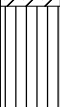


DATE STARTED : 9/1/14

DATE COMPLETED : 10/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
HWT					8.0		SP	SAND: Dark brown, fine grained silica with some silt. (continued)	M	L	9.00: Drill head bouncing on gravel/cobbles while advancing	
				9.00m SPT 8, 5, 6 N=11	8.50m		SC	CLAYEY SILICEOUS SAND: Pale grey, fine to medium grained sand, with weakly cemented (silica) gravel throughout.	M	MD		
				9.45m	10.00m		CH	SILTY CLAY: Brown, high plasticity, with trace fine grained silica sand.	M	F		
				10.50m SPT 0, 0, 5 N=5	10.90m		SM	SILTY SAND: Brown, fine grained, sub-rounded silica.		MD	10.50: Soil is assessed as Firm despite low SPT N value	
				10.95m	11.50m		CL	SILTY CLAY: Dark brown, low plasticity, with trace fine grained silica sand.		St		
				12.00m SPT 0, 0, 1 N=1	12.70m		CI	SANDY CLAY: Dark grey, medium plasticity, sand is coarse grained, sub-angular silica.		St	12.00: Soil is assessed as Stiff despite low SPT N value 12.50: U63 recovery = 450mm 13.00: Hand vane = 80kPa 13.50: Hammer bouncing, SPT damaged.	
				12.45m 12.50m U63	13.00m			from 13.5 to 14.0m with cemented layers, approximately 50mm thick				
				13.50m SPT 8, 12/50mm N=R 13.70m	14.00m			Continued as Cored Drill Hole				
						14.0						13.99: END OF WASHBORE HOLE Casing advance halted by hard stratum. No further penetration possible
						15.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 R5 Page 2 OF 4

CORED DRILL HOLE LOG

HOLE NO : R5

FILE / JOB NO : 301010-01290

SHEET : 3 OF 4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346723.040, N: 5763399.340 (55 MGA94)

SURFACE ELEVATION : -2.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 9/1/14

DATE COMPLETED : 10/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

CASING DIAMETER :

BARREL (Length) :

BIT :

BIT CONDITION :

DRILLING				MATERIAL				FRACTURES				
PROGRESS		CORE LOSS (% RUN %)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50)		NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
DRILLING & CASING	WATER							● Axial ○ Diametral				
				8.0				EL -0.03 VI -0.1 L -0.3 M -1 H -3 VH -10 EH		20 40 100 300 1000		
				9.0								
				10.0								
				11.0								
				12.0								
				13.0								
				14.0		14.00m START CORING AT 14.00m						14.00: Core sample taken
		0% LOSS	14.10m Is(50) D MPa	14.0		SILT (ML): Brown, low plasticity. with some fine grained silica sand and discrete horizons with coarse grained, angular, silica sand, with trace of clay, firm (ML). from 14.0 to 14.1m SILCRETE horizon						14.10: Run 1. 14.0 - 14.5m TCR = 0.5m SCR = 0.1m
		14.50 37% LOSS	14.50m SPT 5, 3, 4 N=7	14.5								14.50: Run 2. 14.5 - 16.0m TCR = 0.95 SCR = 0m
			14.95m	15.0		100mm thick silcrete horizon						15.60: Core sample taken
			Is(50) d=1.7 MPa	15.0		from 15.6 to 15.9m silcrete horizon						
			16.00m	16.0								

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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File: 301010-01290 R5 3 OF 4

AGS 3_1 RTA 1_1 LUB 06.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS GPJ <<DrawingFile>> 13/09/2014 10:23

FINAL Rev 0

CORED DRILL HOLE LOG

HOLE NO : R5

FILE / JOB NO : 301010-01290

SHEET : 4 OF 4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346723.040, N: 5763399.340 (55 MGA94)

SURFACE ELEVATION : -2.550 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 9/1/14

DATE COMPLETED : 10/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

CASING DIAMETER :

BARREL (Length) :

BIT :

BIT CONDITION :

DRILLING				MATERIAL				FRACTURES			
PROGRESS	LOSS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	Weathering	ESTIMATED STRENGTH Is(50)	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA	
DRILLING & CASING	WATER	(CORE LOSS RUN %)			ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)		● Axial ○ Diametral			(joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other	
		37% LOSS	16.0		SILT (ML): Brown, low plasticity, with some fine grained silica sand and discrete horizons with coarse grained, angular, silica sand, with trace of clay, firm (ML). (continued) from 16.0m (approximately), very stiff					16.00: Run 3. 16.0 - 17.5m TCR = 0.95m SCR = 0m	
			16.45m								
		Is(50) d=1.4 MPa	17.0		from 16.8-16.9m, silcrete horizon					16.80: Core sample taken	
		17.50	17.50m		17.50m						
		47% LOSS	17.95m		SILTY SAND (SM): Grey, fine grained sand, sub-rounded silica and trace fine carbonate, medium dense (SM).					17.50: Run 4. 17.5 - 19.0m TCR = 0.8m SCR = 0m	
			18.0								
			19.00							19.00: Run 5. 19.0 - 20.5m	
		SPT 5, 10, 12 N=22	19.0								
			19.45m							19.50: Core destroyed by sampling. Retained as disturbed sample	
			19.50m								
		D	20.0								
			20.20m								
			20.50m		BOREHOLE R5 TERMINATED AT 20.50 m					20.50: Borehole backfilled with cement grout	
			21.0								
			22.0								
			23.0								
			24.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd

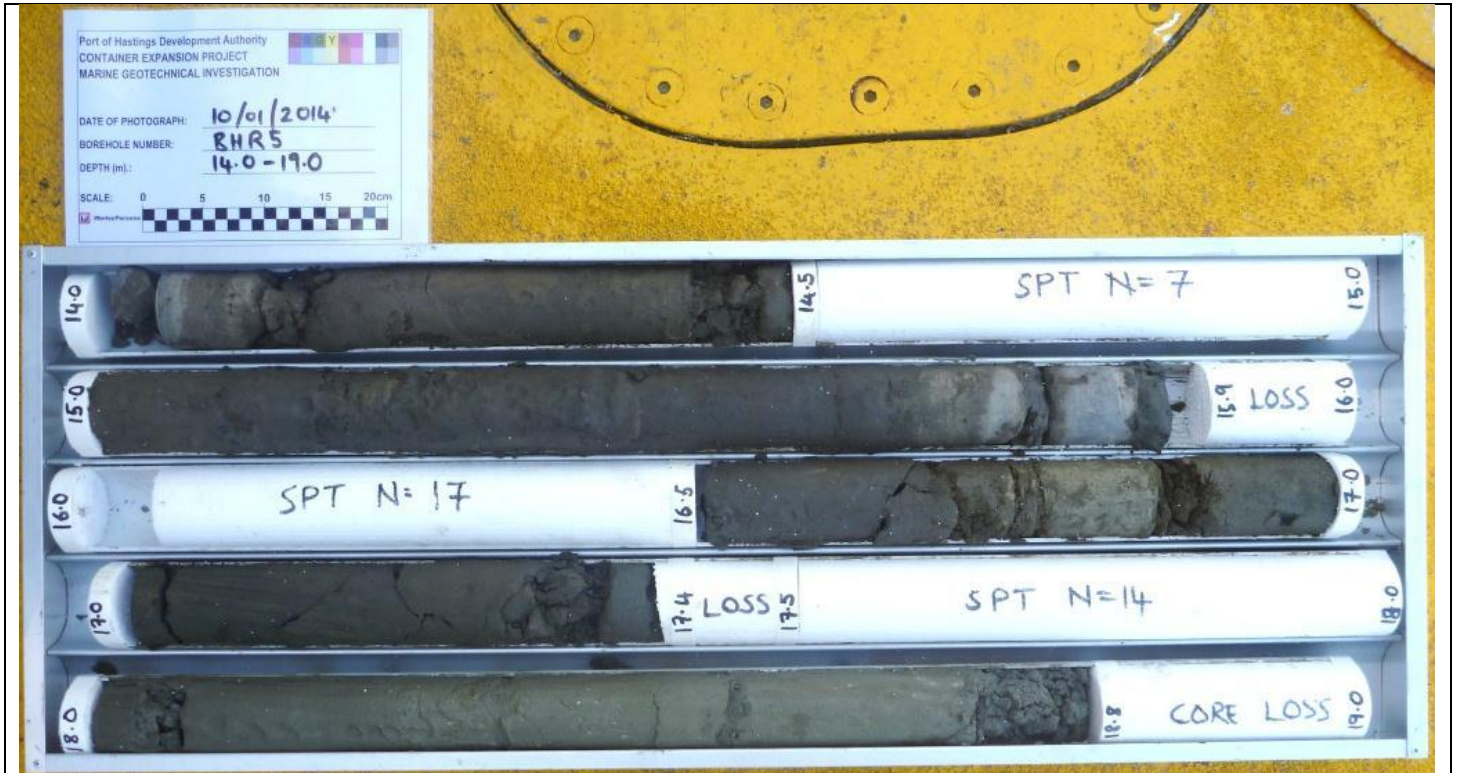


WorleyParsons
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File: 301010-01290 R5 4 OF 4

AGS_3_1 RTA_1_1 UB 08.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ <<DrawingFile>> 13/09/2014 10:23

FINAL Rev 0



R5 – 14.0m to 19.0m

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R6

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347443.200, N: 5762789.100 (55 MGA94)

SURFACE ELEVATION : -7.800 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 6/2/14

DATE COMPLETED : 7/2/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R6 Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R6

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347443.200, N: 5762789.100 (55 MGA94)

SURFACE ELEVATION : -7.800 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


DATE STARTED : 6/2/14

DATE COMPLETED : 7/2/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING & CASING	WATER	PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER												
						U63	8.0		CI	SILTY CLAY: Light grey, minor yellow-brown, fine, medium plasticity, some fine grained silica sand, trace dark grey, high plasticity clay seams, some fine grained sand lenses. <i>(continued)</i> hard from 8.7m depth		Vst	8.40: HP In-situ = 300 - 450 kPa; (pocket penetrometer) Hand vane refusal <

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R6 Page 2 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R6

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 3 OF 3

POSITION : E: 347443.200, N: 5762789.100 (55 MGA94) SURFACE ELEVATION : -7.800 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 6/2/14 DATE COMPLETED : 7/2/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
HWT ↓					16.0			Interbedded SANDY SILT/SILTY SAND: Grey, sandy silt beds contain fine grained silica sand, silty sand beds contain fine to medium grained, sub-angular silica sand.		H / VD			
				16.50m SPT 8, 20, 30 N=50			ML						
				16.95m									
					17.0								
								17.50m					
				18.00m SPT 16, 26, 24/130mm N=R	18.0			SILTY SILICEOUS SAND: Fine to medium grained sand. low plasticity fines.	W				
				18.43m			SM			D			
					19.0								
				19.50m SPT 10, 21, 27 N=48									
				19.95m				19.95m					
					20.0			BOREHOLE R6 TERMINATED AT 19.95 m			19.95: Borehole backfilled with cement grout		
					21.0								
					22.0								
					23.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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FINAL Rev 0

File: 301010-01290 R6 Page 3 OF 3

HOLE NO : R7

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 346036.030, N: 5763368.010 (55 MGA94)

SURFACE ELEVATION : 1.110 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


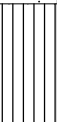






DATE STARTED : 9/5/14

DATE COMPLETED : 10/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>				SPT 0, 1, 2 N=3	0.0		SP	SILICEOUS SAND: Pale brown-yellow, fine to medium grained sand, sub-rounded. trace fine carbonate shell fragments up to 10mm diameter.	W	VL	1.00: Windowless sample from 1.0-1.5m with full recovery ES pH = 7.88 (at 1.4m) 1.10: HP In-situ =220 kPa; (pocket penetrometer)	
				0.45m 0.50m D			CH	CLAY: Grey-blue, high plasticity. with fine to medium grained, silica sand.		VSt		
				1.00m	1.0		SC	CLAYEY SILICEOUS SAND: Brown-orange, becoming grey-blue, medium grained sand, sub-rounded. from 1.0m: becoming pale grey		MD		
				1.50m SPT 4, 9, 9 N=18								
				1.95m	2.0							
				3.00m SPT 13, 17, 22 N=39	3.0		SP-SM	SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-rounded. trace fine carbonate shell fragments.		D		
				3.45m								
					4.0				SILICEOUS SAND: Grey, fine grained sand, sub-rounded.	M		
				4.50m SPT 7, 9, 8 N=17			SP			MD		
				4.95m	5.0							4.90: ES
				6.00m SPT 1, 3, 2 N=5	6.0		ML	SANDY SILT: Dark brown, low plasticity. Fine grained, sub-rounded, silica sand. with occasional grey, fine grained sand pockets up to 20mm thick. from 6.3m: medium to coarse silica sand, pale brown		St		
			6.45m 6.50m U63			SM	SILTY SILICEOUS SAND: Dark brown, fine grained sand, sub-rounded. Organic-rich silt.		MD			
			6.95m	7.0								
			7.50m U63			ML	SANDY SILT: Dark grey, low plasticity. Fine grained, sub-rounded, silica sand. from 7.9m: becoming sandier		St			
			7.95m									

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R7

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346036.030, N: 5763368.010 (55 MGA94)

SURFACE ELEVATION : 1.110 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


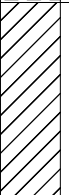

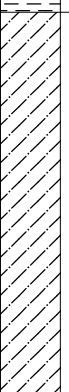
DATE STARTED : 9/5/14

DATE COMPLETED : 10/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL							
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
						8.0		ML	SANDY SILT: Dark grey, low plasticity. Fine grained, sub-rounded, silica sand. <i>(continued)</i>			7.95: Hand vane (Su) = 64kPa
						8.50m			SILTY CLAY: Dark grey, medium plasticity. with horizons of silt.		st	
					9.00m SPT 2, 3, 4 N=7	9.0		CI				
					9.45m U63	9.50m			SANDY SILT: Dark grey to green, low plasticity. Fine grained, sub-rounded, silica sand.			9.45: HP In-situ =100 kPa; (pocket penetrometer)
					9.95m	10.0						9.95: Hand vane (Su) = 180kPa Residual shear = 40kPa
					10.50m U63	10.50m		ML			Vst	
					10.95m	11.0			cemented layer			10.95: Hand vane refusal
						11.50m			SILTY SILICEOUS SAND: Grey-green, fine grained sand, sub-rounded. trace silt.	M		
					12.00m U63	12.0		SM			D	
					12.45m	13.0						
					13.50m SPT 6, 13, 22 N=35	13.50m						
					13.95m	14.0						
					15.00m SPT 8, 11, 19 N=30	15.0						
					15.45m	15.45m			BOREHOLE R7 TERMINATED AT 15.45 m			15.45: Borehole backfilled with cement grout

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R7 Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R8

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346775.290, N: 5762723.580 (55 MGA94)

SURFACE ELEVATION : -7.680 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


DATE STARTED : 6/12/14

DATE COMPLETED : 7/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
↑	HWT			SPT 0, 1, 3 N=4	0.0		SP- SM	SAND: Pale brown, fine to coarse grained sand. trace silt, with many silica carbonate shell fragments.	W	VL	0.50: windowless sample. Refused at 1.05m 0.70: HP In-situ =350 kPa; (pocket penetrometer)	
		0.45m	0.40m	CLAYEY SAND: Grey, medium to coarse grained sand. with trace fine carbonate shell fragments. from 0.6m to 1.0m interbeds of sandy clay, grey, very stiff								
		0.50m										
		ES										
		1.05m										
		1.50m										
		SPT 3, 3, 4 N=7										
		1.95m										
		3.00m										
		SPT 9, 19, 15 N=34										
		3.45m										
		4.50m										
		SPT 19, 31, 0 N=31										
		4.95m										
6.00m												
SPT 5, 7, 8 N=15												
6.45m												
7.50m												
SPT 4, 5, 7 N=12												
7.95m												

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R8

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346775.290, N: 5762723.580 (55 MGA94)

SURFACE ELEVATION : -7.680 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 6/12/14

DATE COMPLETED : 7/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div></div></div>					8.0			SILTY SILICEOUS SAND: Dark brown, fine grained sand. <i>(continued)</i>		MD	
				9.00m SPT 1, 2, 3 N=5	9.0		SM	CLAYEY SILICEOUS SAND: Dark brown, fine grained sand. trace clay and partings of silty medium to coarse silica sand, and carbonate shell fragments.		F	9.00: Soil is assessed as Firm despite low SPT N value
				9.45m 9.50m U63			SC				9.50: Push tube recovery = 220mm
				10.00m	10.0						10.00: Hand vane (Su) = 40 kPa (sandy material)
				10.50m SPT 0, 0, 4 N=4	10.50m			CLAYEY SILT: Dark brown, high plasticity. with pockets (up to 10mm) of pale brown fine sand.		F	10.50: ES and GS Soil is assessed as Firm despite low SPT N value
				10.95m	11.0		MH				
				12.00m SPT 1, 2, 1 N=3	12.0			CLAY: Dark brown, high plasticity. with some medium carbonate shell sand and rare partings of clayey fine silica sand.			12.00: Soil is assessed as Stiff despite low SPT N value
				12.45m			CH				12.50: Push tube attempted, but refused with zero recovery
				13.50m SPT 4, 5, 7 N=12	13.50m			CLAYEY SILT: Dark brown, medium plasticity. trace fine to medium gravel of weakly cemented sand.		St	
				13.95m	14.0		MH				
			15.00m SPT 14, 5, 10 N=15	15.0			SM	SILTY SAND: Dark brown. with pale brown mottle, fine to coarse grained silica with rare weakly cemented zones.		MD	15.00: ES
			15.45m					BOREHOLE R8 TERMINATED AT 15.45 m			15.45: Hole backfilled to surface with cement grout

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

FINAL Rev 0

File: 301010-01290 R8 Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R9

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345637.160, N: 5763021.400 (55 MGA94)

SURFACE ELEVATION : 1.370 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 8/4/14

DATE COMPLETED : 8/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R9 Page 1 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R9

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345637.160, N: 5763021.400 (55 MGA94)

SURFACE ELEVATION : 1.370 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

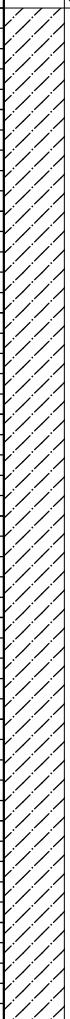
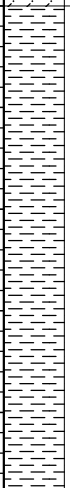
DATE STARTED : 8/4/14

DATE COMPLETED : 8/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER										
HWT ↓					8.0		SM	SILTY SAND: Mottled brown and dark brown, fine to coarse grained sand, trace weakly cemented beds, between 10mm and 100mm thick, trace shell fragments. (continued)	MD	penetrometer) Hand vane (Su) = 80kPa Residual shear = 10kPa	
				9.00m U63	9.0						
				9.40m							9.40: HP In-situ =500 kPa; (pocket penetrometer)
					10.0					100mm thick cemented bed	
				10.50m SPT 5, 13, 13 N=26							
				10.95m	11.0					100mm thick cemented bed	
				12.00m SPT 9, 15, 15 N=30	12.0						
				12.45m							
					13.0						
				13.50m SPT 7, 11, 15 N=26			ML	SILT: Brown, low plasticity, trace fine grained silica sand, trace fine grained shell fragments.	H		
			13.95m	14.0							
			15.00m U63	15.0							
			15.40m		15.40m			BOREHOLE R9 TERMINATED AT 15.40 m		15.40: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal Borehole backfilled with cement grout	

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R9 Page 2 OF 2

HOLE NO : R10

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 346088.390, N: 5762670.120 (55 MGA94)

SURFACE ELEVATION : -3.090 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 14/4/14

DATE COMPLETED : 14/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING					MATERIAL								
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>PWT</div>				P	0.0		ML	SANDY SILT: Dark grey-black, low plasticity. Fine sand.	W	S	0.00: ES & G (taken from grab) pH = 7.64 Piston sample, no recovery 0.50: Piston sample, no recovery		
				0.40m									
				0.50m									
				P	0.90m								
					1.00m			1.00m					
				P	1.40m					SM	SILTY SILICEOUS SAND: Pale grey and pale brown mottled, fine to medium grained sand, sub-rounded to sub-angular.	L	1.00: ES pH = 7.84
					1.50m								
				SPT 0, 0, 1 N=1	1.95m								
					2.00m								
					SPT 2, 3, 6 N=9	2.45m							
					3.0			3.00m					
					3.50m				SP				
				SPT 20, 26, 30 N=56	3.95m								
					4.0								
					4.50m								
					5.00m				SP-SM				
				SPT 17, 23, 27 N=50	5.45m								
					6.0								
					6.50m								
					SPT 15, 21, 25 N=46	6.95m		6.70m			6.50: ES		
									SM				
					7.0								
					8.00m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R10

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346088.390, N: 5762670.120 (55 MGA94)

SURFACE ELEVATION : -3.090 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 14/4/14

DATE COMPLETED : 14/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL							
PROGRESS		DRILLING & CASING	WATER	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
					SPT 12, 8, 10 N=18	8.0			SILTY SILICEOUS SAND: Pale grey, fine to coarse grained sand, sub-rounded. (continued)			
						8.45m		SM			MD	
						9.0			SILTY SAND: Dark grey - dark brown, fine grained sand. with some clay.			
					9.50m SPT 2, 0, 1 N=1						VL	
						9.95m						9.90: ES
					11.00m SPT 6, 6, 12 N=18	11.0		SM				
						11.45m						
						12.0					MD	
					12.50m SPT 0, 5, 10 N=15							
						12.95m						
						13.50m			CLAYEY SAND: Dark grey - dark brown, fine grained sand.			
					14.00m SPT 0, 0, 0 N=0	14.0		SC			VL	
						14.45m						
						15.0			SANDY CLAY: Grey, high plasticity. Fine to coarse grained, sub-rounded to rounded, silica sand.			15.00: Strength of stratum layer assessed as firm following review of recovered SPT sample
					15.50m SPT 0, 0, 36/130mm N=R			CH			F	
						15.93m						
									From 15.88-15.93m: moderately weakly cemented silty sand			
						16.0						

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R10

FILE / JOB NO : 301010-01290

SHEET : 3 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346088.390, N: 5762670.120 (55 MGA94)

SURFACE ELEVATION : -3.090 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 14/4/14

DATE COMPLETED : 14/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
						16.0			SANDY CLAY: Grey, high plasticity. Fine to coarse grained, sub-rounded to rounded, silica sand. <i>(continued)</i>			
								CH	From 16.5m: medium plasticity		F	
					17.00m SPT 11, 1, 2 N=3	17.0						17.00: Soil is assessed as firm despite low SPT N value
					17.45m 17.50m				17.50m			
					U63				CLAYEY SILT: Grey, low plasticity.		Vst	
					17.90m	18.0		ML				17.90: Hand vane (Su) = 120kPa Residual shear = 20kPa
									18.20m			
					18.50m U63				SILTY SILICEOUS SAND: Dark grey, fine to coarse grained sand, rounded to sub-rounded.			
					18.90m	19.0		SM				
									19.50m			
									SILTY SAND: Grey - olive, fine grained sand. trace nodules of carbonate up to 3mm in size.		MD	
					20.00m SPT 2, 4, 8 N=12	20.0						
					20.45m			SM				
						21.0						
					21.50m SPT 7, 11, 18 N=29							
					21.95m	21.95m			21.95m			21.95: Borehole backfilled with cement grout
						22.0			BOREHOLE R10 TERMINATED AT 21.95 m			
						23.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R11

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346814.600, N: 5762039.840 (55 MGA94)

SURFACE ELEVATION : -9.860 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 8/3/14

DATE COMPLETED : 10/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R11

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346814.600, N: 5762039.840 (55 MGA94)

SURFACE ELEVATION : -9.860 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 8/3/14

DATE COMPLETED : 10/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SC	CLAYEY SAND: Dark grey and brown, fine to coarse grained sand, low plasticity. (continued)		L to MD	
								100mm thick cemented sand bed (inferred)			
				9.04m SPT 26, 9, 20 N=29	9.0		SC	CLAYEY SAND: Dark brown. some clayey silt and cemented sand beds up to 100mm thick.		MD	9.00: Utube refusal after 40mm, no recovery
				9.49m				80mm thick cemented sand bed, consistency of high strength rock			
								40mm thick cemented sand bed, consistency of low strength rock			
					10.0						
				10.50m SPT 3, 11, 9 N=20			ML	SILT: Dark brown, low plasticity. some clay, trace fine grained sand, trace cemented sand beds up to 100mm thick. Clay fraction decreasing with depth.		VSI	10.50: ES pH = 7.42
				10.95m 11.00m U63	11.0			40mm thick cemented sand bed, consistency of low strength rock			11.00: G
				11.40m							11.40: HP In-situ =450 kPa; (pocket penetrometer) Hand vane refusal
					11.70m						
				12.00m U63	12.0			SILT: Grey, low plasticity. some fine grained silica sand, some clay, trace shelly beds, shell fragments <5mm.	M		12.00: HP In-situ >600 kPa; (pocket penetrometer)
				12.35m			ML				
								gravelly bed, medium sized, angular (basalt?) gravel			
					13.0						
				13.50m SPT 8, 14, 21 N=35				SANDY SILT: Grey, low plasticity. Fine grained silica sand. trace shell fragments.		H	
				13.95m	14.0		ML				
				15.00m SPT 20, 30/120mm N=R 15.27m	15.0		ML	SANDY SILT INTERBEDDED: SILTY SAND, grey, low plasticity. Fine grained silica sand. trace shell fragments.		H / VD	15.00: ES & G pH = 8.14
				15.50m SPT 8, 24/120mm N=R 15.77m							15.50: SPT hammer double bouncing
				15.77m				BOREHOLE R11 TERMINATED AT 15.77 m			15.77: Borehole backfilled with cement grout

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R12

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345771.850, N: 5762309.110 (55 MGA94)

SURFACE ELEVATION : -1.950 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


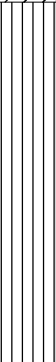


DATE STARTED : 13/3/14

DATE COMPLETED : 14/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
PWT				SPT 0, 0, 0 N=0	0.0		CI	SILTY CLAY: Dark grey, medium plasticity. some fine grained silica sand, some shell fragments and shells.	W	VS	0.00: ES pH = 7.97 SPT sank under self weight, 10% recovery
			0.45m 0.50m U63	0.70m	S			0.50: G Hand vane (Su) = 70kPa RSV = 15kPa			
HWT				0.90m 1.00m P	1.0		CH	SILTY CLAY: Mottled yellow-brown and light grey, high plasticity. fissures up to 1.3m depth up to 50mm across infilled with firm dark grey medium plasticity.	M	St	1.00: ES pH = 8.04 Piston windowless sample 80% recovery
			2.00m	2.0							
				3.00m SPT 6, 11, 16 N=27	3.0		SM	SILTY SAND: Mottled yellow-brown and light grey.	W	MD	
				3.45m	4.0						
				4.50m SPT 8, 11, 13 N=24	4.0						
				4.95m	5.0						
				6.00m SPT 19, 15, 15 N=30	6.0						
				6.45m	7.0			with occasional dark grey beds with some clay			
								becoming brown, fine to medium grained silica sand			
				7.50m SPT 9, 7, 6 N=13	7.60m		ML	SILT: Dark brown. some fine grained sand.	M	St	
				7.95m	8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R12 Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R12

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345771.850, N: 5762309.110 (55 MGA94)

SURFACE ELEVATION : -1.950 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen











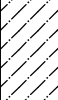








DATE STARTED : 13/3/14

DATE COMPLETED : 14/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		ML	SILT: Dark brown. some fine grained sand. (continued)			
								SILTY CLAY: Dark brown, low plasticity. some fine grained sand, with suspected silty sand horizons.			
				9.00m U63	9.0						
				9.40m						St	9.40: HP In-situ = 120 - 220 kPa; (pocket penetrometer) 2x Hand vane (Su) = 72kPa Residual shear = 6kPa
					10.0		CL				
				10.50m U63							10.40: HP In-situ = 220 - 250 kPa; (pocket penetrometer) Hand vane refusal
				10.90m							10.90: HP In-situ = 220 - 250 kPa; (pocket penetrometer) 2x Hand vane (Su) = 75kPa Residual shear = 4kPa
					11.0						
					11.50m			SILTY SAND: Dark brown, fine to medium grained sand. silica.			
				12.00m U63	12.0		SM			M	
				12.40m							12.40: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal
					13.0			cemented sand bed (inferred)		MD	
					13.30m			CLAYEY SAND: Dark brown, fine grained sand.			
				13.50m SPT 3, 4, 13 N=17			SC				
				13.95m							
					14.0						
					14.50m			SILT: Grey, low plasticity. with some fine grained silica sand, trace clay.			
				15.00m U63	15.0		ML			H	
				15.40m							15.40: HP In-situ >600 kPa; (pocket penetrometer)
					16.0						
					16.00m						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R12

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 3 OF 3

POSITION : E: 345771.850, N: 5762309.110 (55 MGA94) SURFACE ELEVATION : -1.950 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 13/3/14 DATE COMPLETED : 14/3/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
					16.0			CLAYEY SILT: Grey, low plasticity. some fine grained silica sand.					
				16.50m SPT 2, 5, 15 N=20			ML			VSI			
				16.95m				SANDY SILT: Grey, low plasticity. Fine grained silica sand.					
					17.0		ML			H			
								SILTY SILICEOUS SAND: Grey, fine to coarse grained sand. trace trace clay.					
				18.00m SPT 5, 9, 17 N=26	18.0								
				18.45m									
					19.0								
				19.50m SPT 9, 14, 20 N=34			SM			MD - D			
				19.95m	20.0								
				21.00m SPT 5, 7, 14 N=21	21.0								
				21.45m	21.45m			BOREHOLE R12 TERMINATED AT 21.45 m			21.45: Borehole backfilled with cement grout		
					22.0								
					23.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R13

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346144.950, N: 5761977.130 (55 MGA94)

SURFACE ELEVATION : -7.810 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 15/3/14

DATE COMPLETED : 18/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

FINAL Rev 0

File: 301010-01290 R13 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R13

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346144.950, N: 5761977.130 (55 MGA94)

SURFACE ELEVATION : -7.810 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen







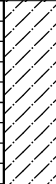
DATE STARTED : 15/3/14

DATE COMPLETED : 18/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SC	CLAYEY SILICEOUS SAND: Dark brown, fine grained sand. with silt, fines are low plasticity. (continued)		L	penetrometer) Hand vane (Su) = 25kPa; =40kPa Residual shear = 8kPa
					8.50m			SANDY CLAY: Grey-brown, low plasticity. Fine to medium grained, sub-rounded to sub-angular silica sand.		Vst	
				9.00m U63	9.0		CL				
				9.30m							9.40: HP In-situ = 200 - 240 kPa; (pocket penetrometer) Hand vane (Su) = 80kPa Residual shear = 20kPa
					9.70m			SILTY CLAY: Grey-brown, high plasticity.			
				10.50m SPT 0, 1, 9 N=10	10.0		CH	200mm thick cemented silt bed (inferred)		St	10.50: SPT sank 250mm under self weight ES pH = 7.7
				10.95m 11.00m U63	11.0			100mm thick cemented silt bed			
				11.40m			ML	SANDY SILT: Grey-brown, low plasticity. Sand is fine to medium grained sand. with clay.		H	11.00: G Hand vane (Su) = 80kPa Residual shear = 10kPa
					11.70m						11.40: HP In-situ = 420 - 500 kPa; (pocket penetrometer) Hand vane refusal
				12.00m U63	12.0		MH	CLAYEY SILT: Grey-brown, low plasticity. trace fine grained sand sand.	M	Vst	12.40: HP In-situ = 200 - 240 kPa; (pocket penetrometer) Hand vane (Su) = 100kPa Residual shear = 12kPa
				12.40m				300mm thick cemented siltstone bed (inferred)			
				13.50m SPT 2, 4, 9 N=13			SM	SILTY SILICEOUS SAND: Grey, fine grained sand. trace shell fragments, trace clay, fines are high plasticity.		MD	
				13.95m	14.0						
					14.50m			SILTY SILICEOUS SAND: Grey, fine grained sand. trace shell fragments, fines are low plasticity silt.		MD	15.00: ES & G pH = 7.61
				15.00m U63	15.0		SM				
				15.40m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R13 Page 2 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R13

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346144.950, N: 5761977.130 (55 MGA94)

SURFACE ELEVATION : -7.810 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 15/3/14

DATE COMPLETED : 18/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL								
PROGRESS		DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER												
							16.0			SILTY SILICEOUS SAND: Grey, fine grained sand. trace shell fragments, fines are low plasticity silt. <i>(continued)</i>			
						16.50m SPT 10, 19, 31/120mm N=R							
						16.92m							
							17.0						
										with some clayey silt beds between 17.5-20.5m			
						18.00m SPT 10, 17, 26 N=43	18.0						
						18.45m							
							19.0		SM			MD	
						19.50m SPT 16, 23, 27/100mm N=R							
						19.90m	20.0				M		
										trace fine grained rounded quartz gravel and numerous shell fragments from 20.5-22.0m			
						21.00m SPT 9, 11, 12 N=23	21.0						
						21.45m							
							22.0			22.00m SILTY SILICEOUS SAND: Grey, fine grained sand. trace shell fragments, fines are non-plastic.			
						22.50m SPT 1, 7, 10 N=17							
						22.95m	23.0		SM			MD	
							24.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R13

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346144.950, N: 5761977.130 (55 MGA94)

SURFACE ELEVATION : -7.810 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


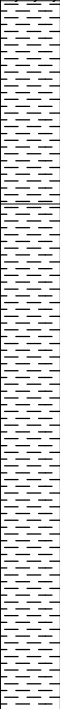
DATE STARTED : 15/3/14

DATE COMPLETED : 18/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
				U63	24.0		SM	SILTY SILICEOUS SAND: Grey, fine grained sand. trace shell fragments, fines are non-plastic. <i>(continued)</i>		MD		
			24.40m									
				25.50m				25.50m				
				U63			ML	SILT: Grey, low plasticity. trace fine grained silica sand, some clay.			25.70: HP In-situ >600 kPa; (pocket penetrometer)	
			25.70m									
					26.0			26.50m				
								CLAYEY SILT: Grey, low plasticity. trace fine grained silica sand, some silt beds.				
				27.00m	27.0							
				SPT 3, 7, 17 N=24								
				27.45m								
					28.0				M			
				28.50m								
				SPT 3, 6, 17 N=23						H		
				28.95m								
					29.0		ML					
				30.00m	30.0							
				SPT 4, 12, 18 N=30								
				30.45m								
					31.0							
				31.50m								
				SPT 4, 8, 19 N=27								
				31.95m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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NON-CORE DRILL HOLE - GEOLOGICAL LOG

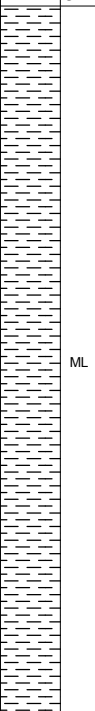
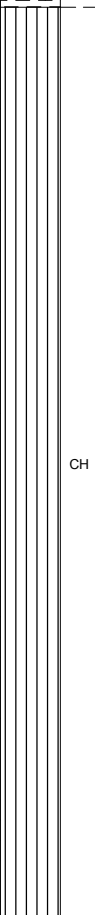
HOLE NO : R13

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346144.950, N: 5761977.130 (55 MGA94) SURFACE ELEVATION : -7.810 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 15/3/14 DATE COMPLETED : 18/3/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					32.0		ML	CLAYEY SILT: Grey, low plasticity. trace fine grained silica sand, some silt beds. <i>(continued)</i>		H	33.00: Utube refusal/bent. No sample recovery	
				33.05m SPT 9, 12, 21 N=33	33.0			occasional weakly cemented beds, typically 10mm thick between 32.4-35.5m				
				33.50m	34.0							
				34.50m SPT 2, 6, 19 N=25	35.0							
				34.95m	35.50m							
							CH	SILTY CLAY: Grey, high plasticity. trace fine grained sand.	M	Vst		
				36.00m SPT 3, 6, 13 N=19	36.0							
				36.45m	37.0							
				37.50m SPT 5, 10, 18 N=28	38.0							
				37.95m	39.0							
				39.00m SPT 2, 8, 17 N=25	39.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R13

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 7 OF 7

POSITION : E: 346144.950, N: 5761977.130 (55 MGA94) SURFACE ELEVATION : -7.810 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 15/3/14 DATE COMPLETED : 18/3/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div>HWT</div>				U63	48.0	<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> 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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R14

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344967.900, N: 5762371.100 (55 MGA94)

SURFACE ELEVATION : 1.350 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 7/4/14

DATE COMPLETED : 7/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components		MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY		STRUCTURE & Other Observations
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 R14 Page 1 OF 3

AGS 3.1 RTA 1.1 LIB 06.2 GLB Log RTA NON-CORE DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ <DrawingFile> 13/09/2014 10:13

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R14

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 3 OF 3

POSITION : E: 344967.900, N: 5762371.100 (55 MGA94) SURFACE ELEVATION : 1.350 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : N Russell
DATE STARTED : 7/4/14 DATE COMPLETED : 7/4/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>HWT</div><div></div></div>	<div><div></div><div></div><div></div></div>			<div><div>16.50m</div><div>SPT 23/100mm N=R 16.60m</div></div>	16.0		SM	SILTY SILICEOUS CARBONATE SAND: Grey, fine grained sand. some weakly cemented beds up to 10mm thick noted.	W	VD	16.50: SPT hammer double bouncing		
					17.0								
<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>			<div><div>18.00m</div><div>SPT 5, 16, 17 N=33</div></div>	17.50		ML	SANDY SILT: Grey, low plasticity. Predominantly silica sand. trace carbonate sand, trace shell fragments.		H			
					18.0								
<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>			<div><div>18.45m</div></div>	18.45			BOREHOLE R14 TERMINATED AT 18.45 m			18.45: Borehole backfilled with cement grout		
					19.0								
<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>				20.0								
					21.0								
<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>				22.0								
					23.0								
<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>				24.0								
					25.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R15

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345459.400, N: 5761916.160 (55 MGA94)

SURFACE ELEVATION : -0.920 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 12/3/14

DATE COMPLETED : 12/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
PWT				P	0.0		ML	SANDY SILT: Dark grey, low plasticity. some shell fragments, trace fine grained sand, organic.	W	VS	0.00: ES pH = 7.9 0.40: Hand vane (Su) = 1.5kPa Residual shear = 0 Downhole Shear Vane (48mm) Torque = 1.5Nm 0.90: Hand vane (Su) = 10kPa Residual shear = 1.5kPa 1.00: ES & G pH = 8.91
			0.40m								
			0.50m								
			P								
				0.90m			From 1.3m: silt and sand content increasing				
			1.00m								
			P								
			1.40m								
HWT					1.60m		CH	SILTY CLAY: Mottled yellow-brown and light grey, high plasticity. trace fine grained sand.	M	St	1.40: HP In-situ = 90 - 120 kPa; (pocket penetrometer) Hand vane (Su) = 40kPa Residual shear = 15kPa 3.00: ES & G pH = 7.92 3.40: HP In-situ = 220 - 300 kPa; (pocket penetrometer) Hand vane (Su) = 148kPa Residual shear = 24kPa
			3.00m								
			U63								
			3.40m								
				3.50m			Plasticity decreased below 3.5m.				
			4.50m								
			U63								
			4.90m								
			5.0				CI			VSt	4.90: HP In-situ = 150 - 220 kPa; (pocket penetrometer) 2x Hand vane (Su) = 110kPa Residual shear = 36kPa
		6.00m									
		U63									
		6.40m									
			6.50m				CH	Interbedded SILTY SAND and SILTY CLAY: mottled yellow-brown and light grey, fine, high plasticity. Silica sand . occasional limonite seam, trace silt beds.		H / MD	6.40: HP In-situ = 200 - 340 kPa; (pocket penetrometer) Hand vane (Su) = 135kPa Residual shear = 22kPa 7.00: ES & G pH = 7.49 7.40: Sand at end of Utube
		7.00m									
		U63									
		7.40m									
		7.50m									
		SPT 5, 6, 10 N=16					CH	20mm thick limonite seam			
		7.95m									
			8.00m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 R15 Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R15

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345459.400, N: 5761916.160 (55 MGA94)

SURFACE ELEVATION : -0.920 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 12/3/14

DATE COMPLETED : 12/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0						
				9.00m SPT 2, 6, 23 N=29	9.0		CH	SILTY CLAY: Mottled yellow-brown and grey, high plasticity. occasional limonite seams, some silt beds up to 20mm thick, trace fine to medium silica sand.		Vst	9.00: SPT performed due to high CPT values at 9.0m
				9.45m				150mm thick limonite seam, consistency of medium strength rock			
					10.0						
				10.50m P			SM	SILTY SAND: Brown, fine to coarse grained sand.		MD	10.50: ES 7 G pH = 6.97
				10.90m							
				11.00m SPT 3, 4, 9 N=13	11.0						10.90: HP In-situ =120 kPa; (pocket penetrometer) Hand vane (Su) = 68kPa Residual shear = 24kPa
				11.45m				SILT: Brown, low plasticity.			
				12.00m U63	12.0			weakly cemented bed, consistency of very low strength rock, 500mm thick	M		12.40: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal
				12.40m							
					13.0					Vst	
				13.50m U63			ML				13.90: HP In-situ = 120 - 170 kPa; (pocket penetrometer) Hand vane (Su) = 60kPa Residual shear = 10kPa
				13.90m	14.0						
				15.00m U63	15.0						15.00: G
				15.32m							
				15.50m SPT 5, 9, 14 N=23				weakly cemented bed, consistency of extremely low strength rock 100mm thick		H	15.32: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal 15.50: ES pH = 7.72
				15.95m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

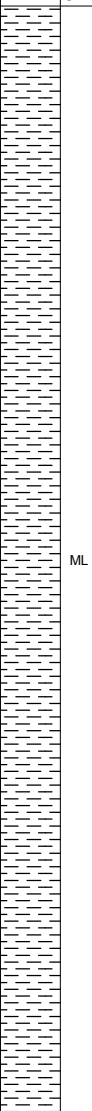
NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R15

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 3 OF 3

POSITION : E: 345459.400, N: 5761916.160 (55 MGA94) SURFACE ELEVATION : -0.920 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 12/3/14 DATE COMPLETED : 12/3/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
	HWT				16.0		ML	SILT: Brown, low plasticity. <i>(continued)</i>	M	H		
				16.50m SPT 5, 10, 16 N=26								
				16.95m								
				18.00m SPT 7, 13, 18 N=31								
				18.45m								
				19.50m SPT 9, 13, 20 N=33								
				19.95m								
				21.00m SPT 19, 23, 27 N=50								
				21.45m		21.45m	BOREHOLE R15 TERMINATED AT 21.45 m			21.45: Borehole backfilled with cement grout		

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R16

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346032.780, N: 5761379.340 (55 MGA94)

SURFACE ELEVATION : -9.470 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 20/3/14

DATE COMPLETED : 21/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
↑ 											

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R16 Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R16

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346032.780, N: 5761379.340 (55 MGA94)

SURFACE ELEVATION : -9.470 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen





DATE STARTED : 20/3/14

DATE COMPLETED : 21/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					8.0		SC	CLAYEY SILICEOUS CARBONATE SAND: Grey-brown, fine to medium grained sand, low plasticity, trace angular quartz gravel and trace carbonate seams. (continued)		MD		
					8.50m			CLAY: Grey-brown, low plasticity, with some fine to medium grained, predominantly silica sand.			9.00: SPT sank 300mm under self weight	
				9.00m SPT 0, 0, 1 N=1	9.0		CL					
				9.45m								
					10.0							
					10.30m							
				10.50m SPT 0, 0, 0 N=0			CH	SILTY CLAY: Grey, high plasticity, trace shell fragments.			10.50: SPT no sample recovery Soil is assessed as firm despite low SPT N value	
				10.95m 11.00m U63	11.0						11.00: ES & G pH = 7.25	
				11.40m				with trace shell fragments below 11.7m			11.40: HP In-situ =170 kPa; (pocket penetrometer) Hand vane (Su) = 70kPa Residual shear = 16kPa	
				12.00m U63	12.0							
				12.40m							12.40: HP In-situ = 200 - 300 kPa; (pocket penetrometer) Hand vane (Su) = 100kPa Residual shear = 20kPa	
					13.0							
					13.30m							
				13.50m U63			ML	SILT: Grey, low plasticity, trace silica sand, trace shell fragments.			13.90: HP In-situ >600 kPa; (pocket penetrometer) Hand vane refusal	
				13.90m								
					14.0							
					15.0						15.40: ES pH = 7.65 HP In-situ >600kPa (pocket penetrometer) Hand vane refusal	
				15.00m U63								
				15.40m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R17

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344773.230, N: 5761890.650 (55 MGA94)

SURFACE ELEVATION : 0.950 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 12/4/14

DATE COMPLETED : 12/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 1

File: 301010-01290 R17 Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R17

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344773.230, N: 5761890.650 (55 MGA94)

SURFACE ELEVATION : 0.950 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 12/4/14

DATE COMPLETED : 12/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL				
PROGRESS		DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER								
		8.0			SILTY SILICEOUS SAND: Pale grey - pale yellow, fine to medium grained sand, sub-rounded to sub-angular. <i>(continued)</i>				
		9.00m SPT 8, 7, 8 N=15							
		9.45m							
		10.0		SM		W	MD		
		10.50m SPT 8, 6, 11 N=17							
		10.95m			At 10.0m 20mm thick band of fine grained, sub-rounded silica gravel			10.90: ES	
		12.00m SPT 4, 0, 0 N=0			12.10m SILTY A SAND: Dark brown, fine to coarse grained sand, sub-rounded.				
		12.45m 12.50m U63		SM	12.70m		VL		
		12.90m		CI	SANDY CLAY: Dark brown, medium plasticity. Fine to medium grained sand.		St	12.60: Hand vane (Su) = 80kPa Residual shear = 22kPa 12.90: Hand vane (Su) = 80kPa Residual shear = 18kPa	
		13.50m U63			13.20m CLAYEY SAND: Dark brown, fine to medium grained sand.				
		13.90m		SC		M	MD	13.90: Hand vane (Su) = 140kPa Residual shear = 40kPa	
		14.0			14.50m CLAYEY SILT: Grey-olive, low plasticity.				
		15.00m U63					Vst		
		15.40m		ML				15.35: ES 15.40: Hand vane (Su) = 110kPa Residual shear = 15kPa	
		16.0			16.00m				

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R17

FILE / JOB NO : 301010-01290

SHEET : 3 OF 3

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 344773.230, N: 5761890.650 (55 MGA94)

SURFACE ELEVATION : 0.950 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

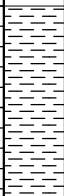
DATE STARTED : 12/4/14

DATE COMPLETED : 12/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
DRILLING & CASING HWT ↓					16.0		ML	CLAYEY SILT: Brown, low plasticity.	M	Vst			
				16.50m U63									
				16.95m				16.95m					
					17.0			BOREHOLE R17 TERMINATED AT 16.95 m			16.95: Hand vane (Su) = 130kPa Residual shear = 32kPa Borehole backfilled with cement grout		
					18.0								
					19.0								
					20.0								
					21.0								
					22.0								
					23.0								
					24.0								

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R18

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345142.080, N: 5761558.200 (55 MGA94)

SURFACE ELEVATION : 0.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 24/3/14

DATE COMPLETED : 26/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R18 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R18

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345142.080, N: 5761558.200 (55 MGA94)

SURFACE ELEVATION : 0.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 24/3/14

DATE COMPLETED : 26/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SM	SILTY SAND: Light-grey, angular to sub-angular, with fine grained silica sand. <i>(continued)</i>	W	H	
								8.50m			
				9.00m SPT 2, 2, 2 N=4	9.0		SM	SILTY SAND: Brown, fine grained sand, trace dark brown/black peat (like coal) seams up to 30mm thick, non-plastic.	M	L	
				9.45m							
					10.0			10.00m			
				10.50m SPT 3, 8, 10 N=18				SILT INTERBEDDED WITH SILTY SAND: Silt beds contain some fine grained silica sand, silty sand beds contain medium grained silica sand, sand is angular to -sub-angular, non plastic, beds 0.1-0.5m thick.			
				10.95m							
					11.0						
				12.00m SPT 1, 4, 17 N=21	12.0		ML		W	MD / VST	
				12.45m							
					13.0						
				13.50m SPT 1, 3, 9 N=12							
				13.95m	14.0						
								14.50m			
				15.00m SPT 0, 0, 2 N=2	15.0		SM	SILTY SAND: Dark brown, fine to medium grained sand, trace clay.	M	VL	
				15.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R18

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345142.080, N: 5761558.200 (55 MGA94)

SURFACE ELEVATION : 0.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 24/3/14

DATE COMPLETED : 26/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING & CASING	WATER	PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER												
							16.0			SILTY SAND: Dark brown, fine to medium grained sand. trace clay. <i>(continued)</i> with some clayey silt beds		VL	18.00: U tube no recovery, however grey silt present on tube
					16.50m SPT 4, 1, 1 N=2								
					16.95m								
						17.0		SM					
					18.00m U63	18.0							
					18.40m								
						19.0			19.00m	SANDY CLAY: Grey, low plasticity. Medium grained, sub-angular silica sand.	M		19.50: Soil is assessed as Stiff despite low SPT N value
					19.50m SPT 3, 3, 0 N=3		CL						
					19.95m								
						20.0							
								20.50m					
										SILTY CLAY: Grey, medium plasticity.			
						21.00m SPT 0, 1, 0 N=1	21.0				SL		21.00: Soil is assessed as Stiff despite low SPT N value
					21.45m								
						22.0		CI					
					22.50m P								
					22.90m								
						23.0							22.90: HP In-situ =220 kPa; (pocket penetrometer) Hand vane (Su) = 90kPa Residual shear = 20kPa
						24.00m	24.0						

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R18

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345142.080, N: 5761558.200 (55 MGA94)

SURFACE ELEVATION : 0.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen






































DATE STARTED : 24/3/14

DATE COMPLETED : 26/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				U63	24.0		CI	SILTY CLAY: Grey, medium plasticity. (continued)		St	
				24.40m				SILT: Grey-brown, low plasticity. trace fine grained silica sand, trace fine to medium grained carbonate sand sand.		Vst	24.40: HP In-situ = 220 kPa; (pocket penetrometer) Hand vane (Su) = 95kPa Residual shear = 10kPa
				25.50m			ML				
				U63							
				25.90m							25.90: HP In-situ = 480 - 520 kPa; (pocket penetrometer) Hand vane refusal
					26.0						
								26.50m			
								SANDY SILT: Grey-brown, low plasticity. Fine grained silica sand. with some medium grained carbonate sand, with some clay, trace weakly cemented beds up to 20mm thick.			
				27.10m							
				SPT 18, 13, 18 N=31							27.00: U tube refusal after 10mm. No recovery
				27.55m			ML				
					28.0						
				28.50m				28.50m		H	
				SPT 7, 13, 21 N=34				SILT: Grey, low plasticity. with some fine grained silica sand, trace sand sized shell fragments, trace clay.			
				28.95m							
					29.0						
											
				30.00m							
				SPT 8, 15, 23 N=38			ML				
				30.45m							
					31.0						
											
				31.50m							
				SPT 8, 15, 21 N=36							
				31.95m							
											
											
											
											
											
											
											
											
											
											
											
											

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R18

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345142.080, N: 5761558.200 (55 MGA94)

SURFACE ELEVATION : 0.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 24/3/14

DATE COMPLETED : 26/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL				
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
					32.0		ML	SILT: Grey, low plasticity, with some fine grained silica sand, trace sand sized shell fragments, trace clay. <i>(continued)</i>	H	
					32.50m			SILTY SAND: Grey, fine grained sand. fines are non plastic.		
				33.00m SPT 19, 13, 20 N=33	33.0		SM		D	
				33.45m						
					34.0			CLAYEY SILT: Grey, low plasticity. some fine grained sand, some silty clay (CL), beds up to 100mm thick.		
				34.50m SPT 4, 7, 15 N=22						
				34.95m						
					35.0			CPT performed from 35.0m - 37.08m		
					36.0				M	
					37.0		ML		H	
				37.50m SPT 3, 6, 11 N=17						
				37.95m						
					38.0					
				39.00m U63	39.0					
				39.40m				clay fraction decreasing slightly below 39.5m		
					40.0					39.40: HP In-situ = 520 - 580 kPa; (pocket penetrometer) Hand vane refusal

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R18

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 345142.080, N: 5761558.200 (55 MGA94)

SURFACE ELEVATION : 0.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 24/3/14

DATE COMPLETED : 26/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>HWT</div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></di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See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R18A

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 3

POSITION : E: 345143.090, N: 5761557.120 (55 MGA94) SURFACE ELEVATION : 0.770 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 24/5/14 DATE COMPLETED : 24/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING					MATERIAL								
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
					8.0			Refer to R18 log for description between seabed and 15.0m depth					
				15.00m U63	15.0			15.00m					
				15.40m			SP	SAND: Dark brown, fine to medium grained sand, low plasticity. trace silt, appears organic.					
				15.50m									
				SPT 0, 6, 7 N=13									
				15.95m									
				16.00m	16.0			16.00m					
									M	MD	15.40: HP In-situ = 140 - 200 kPa; (pocket penetrometer) Hand vane (Su) = 10kPa		

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R19

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345514.950, N: 5761260.650 (55 MGA94)

SURFACE ELEVATION : -5.830 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 10/1/14

DATE COMPLETED : 11/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R19 Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R19

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345514.950, N: 5761260.650 (55 MGA94)

SURFACE ELEVATION : -5.830 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper



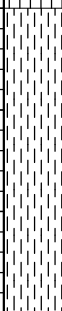


DATE STARTED : 10/1/14

DATE COMPLETED : 11/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SM	SILTY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-rounded to sub-angular. with trace 1-10mm thick lenses of black silty sand and clayey sand. <i>(continued)</i>		L	
					8.50m						
					9.0		CH	SANDY CLAY: Dark brown to black, high plasticity. sand is fine to coarse grained, sub-angular, silica, with trace fine grained, sub-rounded to sub-angular, silica gravel.		st	
				9.00m SPT 3, 4, 6 N=10							
				9.45m							
					10.0		MH	CLAYEY SILT: Dark grey to black, high plasticity. with trace fine grained sand.			
				10.50m U63							
				10.95m							10.95: Hand vane (Su) = 120kPa
					11.0						
					11.50m			CLAYEY SILT: Dark grey, low plasticity. with white carbonate nodules, up to 4mm in diameter.		vst	
				12.00m U63			ML		M		12.25: ES pH = 7.12 12.45: Hand vane (Su) = 150kPa
				12.45m							
					13.0		SM	SILTY SAND: Grey, fine grained sand. with white carbonate nodules, up to 4mm in diameter.			
				13.50m SPT 6, 13, 20 N=33							
				13.95m							
					14.0						
					15.0			from 14.5m with some shells and carbonate nodules to 20mm diameter		D	15.00: G
				15.00m U63							15.25: ES pH = 7.53
				15.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

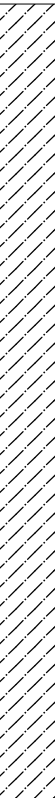
NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R19

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 3 OF 3

POSITION : E: 345514.950, N: 5761260.650 (55 MGA94) SURFACE ELEVATION : -5.830 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 10/1/14 DATE COMPLETED : 11/1/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER												
HWT ↓						16.50m SPT 9, 16, 23 N=39	16.0		SM	SILTY SAND: Grey, fine grained sand. with white carbonate nodules, up to 4mm in diameter. (continued)	M	D	
					16.95m	17.0							
					18.00m SPT 10, 22, 31 N=53	18.0							
					18.45m								
					19.50m SPT 8, 12, 36 N=48	19.0							
					19.95m		19.95m			BOREHOLE R19 TERMINATED AT 19.95 m			
							20.0						
							21.0						
							22.0						
							23.0						
							24.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R20

FILE / JOB NO : 301010-01290

SHEET : 1 OF 4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344837.530, N: 5761198.160 (55 MGA94)

SURFACE ELEVATION : 0.820 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 31/3/14

DATE COMPLETED : 1/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R20 Page 1 OF 4

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R20

FILE / JOB NO : 301010-01290

SHEET : 2 OF 4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344837.530, N: 5761198.160 (55 MGA94)

SURFACE ELEVATION : 0.820 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen





DATE STARTED : 31/3/14

DATE COMPLETED : 1/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		CI	Medium plasticity. (continued)	M	Vst	penetrometer) (higher pp in yellow-brown seam) Hand vane (Su) = 150kPa Residual shear = 20kPa 9.00: U tube refusal on limonite seam 50mm thick 9.20: HP In-situ = 300 - 600 kPa; (pocket penetrometer) (higher pp in yellow-brown seam) 9.50: Slow drilling from 9.5m - 10.5m due to limonite seams
					8.50m			High plasticity. numerous limonite seams from 8.5-9.6m.			
				9.00m U63 9.20m	9.0		CH				
					9.60m			Low plasticity seams below 9.6m depth.			
					10.0		CL		D	VL	10.90: HP In-situ = 380 - 420 kPa; (pocket penetrometer) Hand vane refusal 12.00: U tube refusal after 10mm. No recovery 12.10: Soil is assessed as Very Stiff despite low SPT N value
				10.50m U63 10.90m	11.0						
					11.50m			SILTY CLAY: Red-brown. trace iron oxide cementation, fine to coarse grained sand, some clayey silt seams.			
				12.10m SPT 1, 0, 3 N=3 12.55m	12.0		CL				
					13.0		SM	SILTY SAND: Fine to medium grained sand. weakly cemented in part (iron oxide cement).			
				13.50m SPT 4, 2, 2 N=4 13.95m	14.0						
				15.00m U63 15.20m	15.0						
								Continued as Cored Drill Hole			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

CORED DRILL HOLE LOG

HOLE NO : R20

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 3 OF 4

POSITION : E: 344837.530, N: 5761198.160 (55 MGA94) SURFACE ELEVATION : 0.820 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 31/3/14 DATE COMPLETED : 1/4/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : C Pilkington
CASING DIAMETER : BARREL (Length) : BIT : BIT CONDITION :

DRILLING				MATERIAL				FRACTURES			
DRILLING & CASING	WATER	CORE LOSS RUN (%)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● Axial ○ Diametral	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
				8.0							
				9.0							
				10.0							
				11.0							
				12.0							
				13.0							
				14.0							
				15.0							
				15.20m		START CORING AT 15.20m					
		0% LOSS		15.50m		SILTY CLAY (CH): Red-brown, occasional iron oxide cemented corestones up to 100mm diameter observed.					
				15.90m							
				16.00		SILTSTONE CEMENTED CLAY: brown, ferruginised					
				16.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 R20 3 OF 4

AGS 3_1 RTA 1_1 LUB 08.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ <<DrawingFile>> 13/09/2014 10:23

FINAL Rev 0

CORED DRILL HOLE LOG

HOLE NO : R20

FILE / JOB NO : 301010-01290

SHEET : 4 OF 4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344837.530, N: 5761198.160 (55 MGA94)

SURFACE ELEVATION : 0.820 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 31/3/14

DATE COMPLETED : 1/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

CASING DIAMETER :

BARREL (Length) :

BIT :

BIT CONDITION :

DRILLING				MATERIAL				FRACTURES			
DRILLING & CASING	WATER	LOSS (CORE LOSS RUN %)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● Axial ○ Diametral	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
		72% LOSS	= 1.5	16.0		SILTSTONE CEMENTED CLAY: brown, ferruginised (continued)					16.00: Core loss from 16.0-17.1m
		17.50		17.0							
		72% LOSS		18.0							17.50: Core loss from 17.5-18.6m
		19.00		19.0		CEMENTED CLAY: brown, with trace fine grained silica sand, trace shell fragments					19.00: Core loss from 19.0-19.45m
		30% LOSS		20.0							PR
		20.50		21.0							PR
		0% LOSS		22.0							
		7% LOSS		23.0		grey from 23.0m					
		23.50		23.50		BOREHOLE R20 TERMINATED AT 23.50 m					PR 23.40: Borehole backfilled with cement grout

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

File: 301010-01290 R20 4 OF 4



DATE OF PHOTOGRAPH: 1 APRIL 2014
BOREHOLE NUMBER: BHR20
DEPTH (m): 15.2 - 23.5
SCALE: 0 5 10 15 20cm



R20 15.2m to 23.5m

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R21

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345577.150, N: 5760571.280 (55 MGA94)

SURFACE ELEVATION : -7.970 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 5/3/14

DATE COMPLETED : 6/3/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 1

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R21

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345577.150, N: 5760571.280 (55 MGA94)

SURFACE ELEVATION : -7.970 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 5/3/14

DATE COMPLETED : 6/3/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL				
PROGRESS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING									
WATER									
DRILLING PENETRATION									
GROUND WATER LEVELS									
SAMPLES & FIELD TESTS									
	8.0			SILTY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-rounded to sub-angular. <i>(continued)</i>					
	8.50m								
	SPT 6, 12, 12 N=24								
	8.95m								
	9.0								
	9.50m			SILTY CLAY: Pale grey and pale brown mottled, high plasticity. with trace fine grained sand.					
	10.00m								
	SPT 5, 11, 16 N=27								
	10.0								
	10.20m			SANDY CLAY: Brown, high plasticity. Fine to coarse grained, rounded to sub-rounded silica sand. with trace fine to medium grained, sub-rounded silica gravel.					
	10.35m			SILTY SAND: Pale brown, fine grained sand.					
	10.45m								
	11.00m								
	SPT 4, 5, 7 N=12								
	11.0								
	11.10m			CLAYEY SILICEOUS SAND: Dark brown, fine to coarse grained sand, sub-rounded. with some fine grained, sub-rounded to rounded silica gravel.					
	11.35m			SILTY CLAY: Brown, medium plasticity. with trace fine grained sand.					
	11.45m								
	11.50m								
	U63								
	11.95m								
	12.0								
	12.50m			CLAYEY SILT: Dark brown, medium plasticity. with trace fine grained sand.					
	13.00m								
	U63								
	13.45m								
	14.0								
	14.50m								
	U63								
	14.95m								
	15.0			BOREHOLE R21 TERMINATED AT 14.95 m					
	16.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 1

File: 301010-01290 R21 Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R22

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344541.480, N: 5760837.730 (55 MGA94)

SURFACE ELEVATION : 1.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 28/3/14

DATE COMPLETED : 28/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>PWT</div>					0.0		SP	0.10m SILTY SAND: Dark grey, fine grained sand. with some clay, with some shell fragments. SILTY SILICEOUS SAND: Dark grey, fine to medium grained sand, medium plasticity. trace shells and shell fragments.			0.00: ES & G (taken from grab) pH = 7.52	
					0.40m						0.40: Hand vane (Su) = 1.25kPa Residual shear = 0kPa	
					0.50m							
					0.90m		SM			W	VL	0.90: Hand vane (Su) = 5kPa Residual shear = 1kPa 1.00: Windowless sample from 1.0-2.0m G (from 1.0-1.4m)
					1.00m			1.40m				
									SILTY CLAY: Light grey, medium plasticity. trace fine grained sand.		St	1.40: ES pH = 8.69
					2.00m							
					3.00m		CI					
					3.40m					M	Vst	3.40: HP In-situ =390 kPa; (pocket penetrometer) Hand vane refusal
						4.0						
				4.50m			4.70m				4.50: Hand vane (Su) = 110kPa	
				4.90m				SILTY SILICEOUS CARBONATE SAND: Light grey, fine to medium grained sand, sub-angular.				
					5.0		SM					
							5.50m	SILICEOUS SAND: Light brown, fine to medium grained sand. trace silt.				
				6.00m	6.0					VD	6.00: double bounced	
				SPT 5, 27, 23/60mm N=R								
				6.36m								
					7.0		SP		W		6.80: Rapid drilling from 6.8-8.5m 7.00: Borehole collapsing from 7.0-8.0m	
				7.50m						VL		
				SPT 1, 0, 0 N=0								
				7.95m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 R22 Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R22

FILE / JOB NO : 301010-01290

SHEET : 2 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344541.480, N: 5760837.730 (55 MGA94)

SURFACE ELEVATION : 1.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


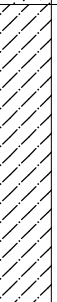


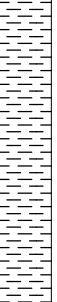
DATE STARTED : 28/3/14

DATE COMPLETED : 28/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SP	SILICEOUS SAND: Light brown, fine to medium grained sand. trace silt. <i>(continued)</i>		VL	10.50: ES & G
				9.00m SPT 2, 4, 6 N=10	8.50m		SM	SILTY SILICEOUS SAND: Dark brown, fine grained sand. some very stiff silt beds up to 100mm thick, non-plastic, potentially organic.		L	
				9.45m	10.00m			SILTY SILICEOUS SAND: Dark brown, fine grained sand. Low plasticity silt. some organics.		L	
				10.50m SPT 2, 2, 3 N=5	10.95m						
				11.0	11.50m						
				12.00m SPT 5, 8, 11 N=19	12.45m		SM	SILTY SILICEOUS SAND INTERBEDDED WITH SILT: Dark brown, fine grained sand. silt contains fine grained sand, potentially organic.		MD / VSt	
				13.0	13.50m SPT 7, 6, 7 N=13		SP- SM	SAND INTERBEDDED WITH SANDY SILT: Medium to coarse grained sand, sub-angular to angular. with sand is silica and feldspar sand. Sandy silt contains fine grained silica sand, non-plastic silt.			
				13.95m	14.00m			SANDY SILT: Grey, low plasticity. Fine grained silica sand. trace clay, weakly cemented at 14.0 and 14.5m.		VSt	
				15.00m SPT 5, 4, 6 N=10	15.45m		ML				
					16.00m						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R22

FILE / JOB NO : 301010-01290

SHEET : 3 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344541.480, N: 5760837.730 (55 MGA94)

SURFACE ELEVATION : 1.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 28/3/14

DATE COMPLETED : 28/3/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					16.0			SANDY CLAY: Grey, low plasticity.		Vst	
				16.50m SPT 4, 5, 7 N=12			CL				
				16.95m	17.0					Vst / H	
								17.30m			
								CLAYEY SILT /SILTY CLAY: Grey, low plasticity. trace fine grained sand.			
				18.00m U63	18.0		ML			Vst	18.40: HP In-situ = 240 - 320 kPa; (pocket penetrometer) Hand vane (Su) = 120kPa
				18.40m							
					19.0			19.00m			
				19.50m U63				SILT: Grey, low plasticity. with some fine grained sand, trace shell fragments.	M		
				19.90m	20.0						19.90: HP In-situ =530 kPa; (pocket penetrometer) Hand vane refusal
				21.00m U63	21.0		ML			H	21.00: U tube refusal after 30mm HP In-situ = 530kPa (pocket penetrometer)
				21.30m							
					22.0			with some clay from 22.0m			
				22.50m SPT 5, 9, 15 N=24							
				22.95m	23.0			22.95m			22.95: Borehole backfilled with cement grout
								BOREHOLE R22 TERMINATED AT 22.95 m			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R23

FILE / JOB NO : 301010-01290

SHEET : 1 OF 3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344907.250, N: 5760531.160 (55 MGA94)

SURFACE ELEVATION : 0.920 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 2/4/14

DATE COMPLETED : 2/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 R23 Page 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R23

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 2 OF 3

POSITION : E: 344907.250, N: 5760531.160 (55 MGA94) SURFACE ELEVATION : 0.920 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 2/4/14 DATE COMPLETED : 2/4/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : C Pilkington

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SM	SILTY SAND: Light brown, fine grained sand, sub-rounded, trace medium to coarse sand beds with trace silt up to 100mm thick. <i>(continued)</i>	W	MD	
				9.00m SPT 1, 1, 6 N=7	9.0		SM	SILTY SILICEOUS SAND: Dark brown, fine to medium grained sand, low plasticity, trace silty sand beds up to 100mm thick, fines are low plasticity.		L	
				9.45m							
					10.0			SILTY SILICEOUS SAND: Dark grey-brown, fine grained sand. Low plasticity silt, trace clay.			
				10.50m SPT 2, 3, 4 N=7							10.50: SPT 50% recovery
				10.95m							
					12.0		SM		M	L - MD	
				12.00m SPT 4, 6, 8 N=14							
				12.45m							
					13.0			with some clay, trace coarse grained clayey sand beds			
				13.50m SPT 3, 3, 4 N=7							
				13.95m							
					14.0						
					14.50m			CLAYEY SILT: Grey-brown, high plasticity, with fine grained sand.			
				15.00m U63	15.0		MH			St - VSt	15.00: HP In-situ =120 kPa; (pocket penetrometer) Hand vane (Su) = 60kPa Residual shear = 20kPa
				15.40m							
					16.00m						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : R23

FILE / JOB NO : 301010-01290

SHEET : 3 OF 3

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 344907.250, N: 5760531.160 (55 MGA94)

SURFACE ELEVATION : 0.920 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 2/4/14

DATE COMPLETED : 2/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
DRILLING & CASING	HWT ↓				16.0		ML	CLAYEY SILT: Brown-grey, low plasticity. trace fine grained sand.	M	St - Vst			
				16.50m U63									
				16.90m									
					17.0			BOREHOLE R23 TERMINATED AT 16.90 m			16.90: HP In-situ = 350 - 400 kPa; (pocket penetrometer) Hand vane (Su) = 120kPa Borehole backfilled with cement grout		
					18.0								
					19.0								
					20.0								
					21.0								
					22.0								
					23.0								
					24.0								

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S1

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347709.260, N: 5763826.400 (55 MGA94)

SURFACE ELEVATION : -0.780 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 13/1/14

DATE COMPLETED : 18/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 S1 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S1

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347709.260, N: 5763826.400 (55 MGA94)

SURFACE ELEVATION : -0.780 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 13/1/14

DATE COMPLETED : 18/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0			SAND: Pale grey, fine to medium grained sand, sub-angular, silica, with trace of silt. <i>(continued)</i>		D	
				9.00m SPT 32, 18/60mm N=R 9.21m			SP				9.00: Hammer bouncing ES pH = 6.4
										VD	
				10.50m SPT 28, 22/130mm N=R 10.78m				becoming pale brown and grey			
								11.50m			
				12.00m SPT 0, 0, 5 N=5	12.0			SILT: Dark brown, low plasticity.	M	St	12.00: HP In-situ = 50kPa; (pocket penetrometer) ES pH = 5.91 Soil is assessed as Stiff despite low SPT N value
				12.45m 12.50m U63							
				13.00m	13.0					Vst	13.00: Hand vane (Su) = 104kPa
				13.50m SPT 1, 1, 4 N=5			ML				13.50: Soil is assessed as Very Stiff despite low SPT N value
				13.95m 14.00m U63	14.0						
				14.50m							14.50: Hand vane (Su) = 72kPa
				15.00m U63	15.0					St	
				15.50m			SC	CLAYEY SILICEOUS SAND: Grey, medium to coarse grained sand, sub-angular.			15.50: Hand vane (Su) not possible - too much sand to insert
								16.00m			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S1 Page 2 OF 7

HOLE NO : S1

FILE / JOB NO : 301010-01290

FILE / JOB NO. : 3
SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 347709.260, N: 5763826.400 (55 MGA94)

SURFACE ELEVATION : -0.780 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 13/1/14

DATE COMPLETED : 18/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL					
PROGRESS			GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER	DRILLING PENETRATION									
					16.0			CLAY: Grey, high plasticity. with some fine to medium sub-rounded silica sand.	M	St	16.50: HP In-situ =160 kPa; Soil is assessed as Stiff despite low SPT N value; (pocket penetrometer)
			16.50m SPT 1, 1, 4 N=5			CH					
			16.95m								
					17.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S1

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347709.260, N: 5763826.400 (55 MGA94)

SURFACE ELEVATION : -0.780 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

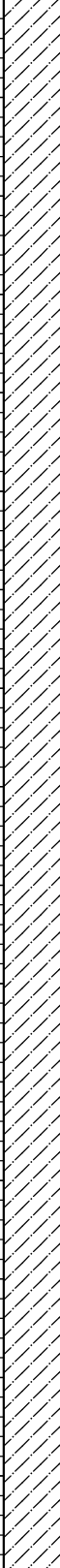
DATE STARTED : 13/1/14

DATE COMPLETED : 18/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
HWT				SPT 11, 26, 34 N=60	24.0		SM	SILTY SAND: Dark grey, fine to medium grained sand, trace clay, trace fine gravel size cemented/mudstone fragments, trace silty sand beds typically 20mm thick. <i>(continued)</i>	M	D		
			24.45m									
			25.50m									
			SPT 10, 22, 28/130mm N=R									
			25.93m									
			27.00m									
			SPT 31, 33, 17/70mm N=R									
			27.37m									
			28.0									
			28.50m									
			SPT 12, 18, 21 N=39									
			28.95m									
			30.00m									
			SPT 4, 11, 20 N=31									
			30.45m									
		31.0										
		31.50m										
		SPT 11, 21, 24 N=45										
		31.95m										

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

FINAL Rev 0

File: 301010-01290 S1 Page 4 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S1

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347709.260, N: 5763826.400 (55 MGA94)

SURFACE ELEVATION : -0.780 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 13/1/14

DATE COMPLETED : 18/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					32.0			SILTY SAND: Dark grey, fine to medium grained sand, trace clay, trace fine gravel size cemented/mudstone fragments, trace silty sand beds typically 20mm thick. <i>(continued)</i>			
				33.00m SPT 9, 23, 25 N=48	33.0						
				33.45m							
					34.0			34-35m: trace fine gravel sized cemented mudstone gravel			
				34.50m SPT 6, 13, 23 N=36							
				34.95m	35.0						
								35.50m with trace fine to medium calcareous sand			
				36.00m SPT 4, 16, 18 N=34	36.0		SM		M		
				36.45m							
					37.0			clay fraction increasing			
				37.50m SPT 3, 5, 15 N=20							
				37.95m	38.0						
				39.00m SPT 5, 11, 18 N=29	39.0						
				39.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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Consulting

FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S1

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347709.260, N: 5763826.400 (55 MGA94)

SURFACE ELEVATION : -0.780 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

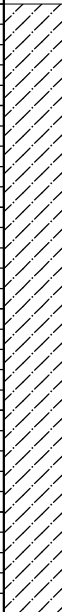
DATE STARTED : 13/1/14

DATE COMPLETED : 18/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER							Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components			
					40.0		SM	SILTY SAND: Dark grey, fine to medium grained sand, trace clay, trace fine gravel size cemented/mudstone fragments, trace silty sand beds typically 20mm thick. <i>(continued)</i>		MD	
				40.50m SPT 6, 10, 19 N=29							
				40.95m							
				41.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 S1 Page 6 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S2

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346521.190, N: 5764208.430 (55 MGA94)

SURFACE ELEVATION : 1.328 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 8/5/14

DATE COMPLETED : 8/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S2 Page 1 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S2

FILE / JOB NO : 301010-01290

SHEET : 2 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346521.190, N: 5764208.430 (55 MGA94)

SURFACE ELEVATION : 1.328 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 8/5/14

DATE COMPLETED : 8/5/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div>HWT</div><div></div></div>				8.10m	8.0			CLAY: Olive-green, with pale grey interbeds, high plasticity. trace medium to coarse grained, sub-rounded silica sand, exhibits poorly developed fissuring. <i>(continued)</i>			shoe
							CH	8.50m		Vst	
				9.00m U63	9.0		CH	...cemented band			
				9.45m SPT 4, 2, 9 N=11				9.50m ...cemented band		St - Vst	9.45: Hand vane refusal due to cemented horizon 9.50: ES
				9.95m	10.0						10.00: Drilling encountered cemented horizon. U63 not expected to be possible
				10.50m SPT 6, 13, 14 N=27			ML			Vst	
				10.95m	11.0			...weakly cemented horizon, 50mm thick			10.95: HP In-situ =275 kPa; (pocket penetrometer) (Cu = 137kPa) 11.00: Hard layer at 11.0m
								11.50m		M	11.50: Hard drilling from 11.5m
				12.00m SPT 2, 12, 20/20mm N=R 12.32m	12.0			SILTY SILICEOUS SAND: Dark grey, fine grained sand, sub-rounded.		D	12.00: SPT hammer bouncing
					13.0						
				13.50m SPT 4, 5, 12 N=17			SM			MD	
				13.95m	14.0			From 14.0m: becoming sandy silt			
			14.50m SPT 8, 13, 17 N=30						D		
			14.95m	15.0			14.95m	BOREHOLE S2 TERMINATED AT 14.95 m			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S2 Page 2 OF 2

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S3

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347750.280, N: 5763149.250 (55 MGA94)

SURFACE ELEVATION : -9.060 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 20/1/14

DATE COMPLETED : 23/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
↑ PWT ↓				SPT 3, 1, 4 N=5	0.0		SW-SM	SAND: Brown, white and grey, medium to coarse grained sand. sub-rounded silica and angular carbonate shell fragments, with some silt, and shells up to 20mm.	W	VL		
				0.45m 0.50m D			CH	CLAY: Grey mottled yellow-brown, high plasticity. with trace fine and medium grained silica sand.		Vst	0.50: HP In-situ = 310 - 320 kPa; (pocket penetrometer)	
				1.50m U63							0.90: ES pH = 7.4	
											1.50: Hand vane (Su) = 184kPa	
				2.00m			CI	SANDY CLAY: Grey, medium plasticity. Medium to coarse grained, sub-angular silica sand.		Vst - H	2.00: HP In-situ = 350 - 450 kPa; (pocket penetrometer) Hand vane refusal	
				3.00m SPT 19, 30, 20/70mm N=R 3.37m			SW	SAND: Pale grey, fine to medium grained sand. sub-rounded silica, with trace silt.			3.00: U63 tube refusal	
				4.50m SPT 3, 10, 30/80mm N=R 4.88m								
				6.00m SPT 15, 30/70mm N=R 6.22m				from 6.0m, becoming pale brown				
				7.50m SPT 15, 50/150mm N=R 7.80m								
						</						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S3 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S3

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347750.280, N: 5763149.250 (55 MGA94)

SURFACE ELEVATION : -9.060 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 20/1/14

DATE COMPLETED : 23/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
					8.0		SW	SAND: Pale grey, fine to medium grained sand. sub-rounded silica, with trace silt. <i>(continued)</i>					
				9.00m SPT 25, 35, 15/70mm N=R 9.37m	9.0			SAND: Dark brown to black, fine grained sand. with sub-rounded silica, very weakly cemented, suspected high organics. Organic odour silt.		VD	9.00: 2xD		
							SW-SM				9.50: ES		
				10.50m SPT 20, 28, 22/110mm N=R 10.91m	10.0						10.50: ES		
					11.0								
				12.00m SPT 3, 3, 6 N=9	12.0		SM	SILTY SILICEOUS SAND: Dark brown, fine grained sand, low plasticity. fines are non-plastic.	M	VSt			
				12.45m 12.50m U63									
				13.00m	13.0					H	13.00: Hand vane (Su) = 280kPa		
				13.50m U63				SILTY CLAY: Dark grey to brown, high plasticity. sand is coarse grained, sub-rounded silica.					
				14.00m	14.0		CH			VSt	14.00: Hand vane (Su) = 164kPa		
				15.00m U63	15.0			CLAYEY SILT: Dark grey, low plasticity. with trace fine grained silica sand.					
				15.50m			ML			VSt	15.50: Hand vane (Su) = 164kPa		

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S3 Page 2 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S3

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347750.280, N: 5763149.250 (55 MGA94)

SURFACE ELEVATION : -9.060 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 20/1/14

DATE COMPLETED : 23/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					16.0			CLAYEY SILT: Dark grey, low plasticity. with trace fine grained silica sand. <i>(continued)</i>		VSI	
				16.50m U63			ML				
				17.00m				SILTY SILICEOUS SAND: Grey-green, mottled orange-brown, fine grained sand. trace fine to medium grained carbonate shell fragments.			17.00: Hand vane (Su) refusal
				18.00m U63							18.00: U63 refused after 300mm
				18.30m							18.30: Hand vane (Su) refusal
					19.0						
				19.50m SPT 8, 21, 28 N=49							19.50: U63 refusal
				19.95m							
					20.0		SM			D	
				21.00m SPT 12, 25, 25/110mm N=R							
				21.41m							
					22.0						
				22.50m SPT 17, 28, 22/90mm N=R							
				22.89m							
					23.0						
				24.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S3 Page 3 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S3

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347750.280, N: 5763149.250 (55 MGA94)

SURFACE ELEVATION : -9.060 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen




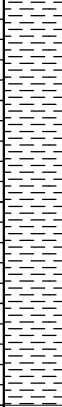

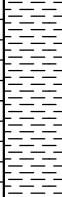
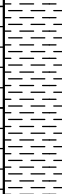
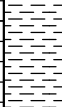
DATE STARTED : 20/1/14

DATE COMPLETED : 23/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
				SPT 7, 12, 26 N=38	24.0		SM	SILTY SILICEOUS SAND: Grey-green, mottled orange-brown, fine grained sand. trace fine to medium grained carbonate shell fragments. (continued) from 24.0 to 24.3m, with abundant fine carbonate shell gravel	M	D	24.40: HP In-situ =320 kPa; (pocket penetrometer)	
			24.45m									
				25.50m SPT 10, 18, 26 N=44	25.0		SM	SILTY SAND: Grey-brown, fine grained silica sand, with trace fine sand-sized carbonate shell fragments.	M	D		
			25.95m									
				27.00m SPT 7, 16, 24 N=40	27.0		SM	at 27.5m, with pocket of sandy, fine grained carbonate shell gravel	M	D		
			27.45m									
					28.0		ML	SANDY SILT: Grey-green, low plasticity. Fine grained silica sand. with trace fine grained carbonate shell sand.	M	Vst	28.50: HP In-situ =320 kPa; (pocket penetrometer)	
			28.50m SPT 9, 14, 20 N=34									
			28.95m									
					29.0		ML		M	Vst		
				30.00m SPT 7, 14, 22 N=36	30.0		ML	SILT: Grey-green, low plasticity. with trace fine grained silica sand and fine carbonate shell fragments.	M	H		
			30.45m									
					31.0		ML	from 31.0 to 32.5m (approx) with trace clay	M	Vst		
				31.50m SPT 5, 13, 20 N=33			ML		M	Vst		
			31.95m									

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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File: 301010-01290 S3 Page 4 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S3

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347750.280, N: 5763149.250 (55 MGA94)

SURFACE ELEVATION : -9.060 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 20/1/14

DATE COMPLETED : 23/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					32.0			SILT: Grey-green, low plasticity, with trace fine grained silica sand and fine carbonate shell fragments. <i>(continued)</i>			32.00: HP In-situ =230 kPa; (pocket penetrometer)	
				33.00m SPT 9, 15, 21 N=36	33.0		ML			Vst		
				33.45m								
					34.0			SILT: Grey-green, low plasticity, with medium-coarse grained carbonate shell sand. Locally very weakly cemented.				
				34.50m SPT 5, 6, 15 N=21			ML			St		
				34.95m								
					35.0			SILT: Dark grey-green, low plasticity, with trace fine grained silica sand and trace fine grained carbonate shell fragments.				
									M			
				36.00m SPT 5, 8, 18 N=26	36.0						36.00: HP In-situ =220 kPa; (pocket penetrometer)	
				36.45m								
					37.0							
				37.50m SPT 4, 9, 22 N=31			ML			Vst		
				37.95m								
					38.0							
				39.00m SPT 5, 11, 23 N=34	39.0							
				39.45m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

HOLE NO : S3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 7 OF 7

POSITION : E: 347750.280, N: 5763149.250 (55 MGA94)

SURFACE ELEVATION : -9.060 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 20/1/14

DATE COMPLETED : 23/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

Drilling						Material						
Progress		Drilling Penetration	Ground Water Levels	Samples & Field Tests	Depth (m)	Graphic Log	Classification Symbol	Material Description Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	Moisture Condition	Consistency	Relative Density	Structure & Other Observations
Drilling & Casing	Water											
					48.0							48.00: Casing stuck at 48.0m. Hole terminated. Casing removed by overdrilling. Borehole backfilled with cement grout
					49.0							
					50.0							
					51.0							
					52.0							
					53.0							
					54.0							
					55.0							
					56.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S4

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347082.800, N: 5763087.200 (55 MGA94)

SURFACE ELEVATION : -6.540 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen



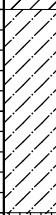


DATE STARTED : 11/1/14

DATE COMPLETED : 15/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
↑				SPT 2, 1, 1 N*=2	0.0		SP	0.15m SAND: Brown, white and dark grey, medium to coarse grained sand. sub-rounded silica and carbonate shell fragments, with some silt. SANDY CLAY: Grey, medium plasticity. mottled orange brown, sand is medium, sub-rounded silica.	W	VL	0.00: sample of sand and clay bagged separately bag1 = clay bag2 = sand	
				0.45m 0.50m D						F	0.70: ES	
				1.50m U63			CI			St	1.20: D	
				1.85m						H	1.40: HP In-situ =150 kPa; (pocket penetrometer)	
											1.85: U63 refused at 1.85m, 350mm recovery At 1.85m HV refusal HP = 440kPa 2.00: From 2.0m casing advancer encounters harder ground	
				3.00m SPT 18, 24, 26/130mm N*=R	3.0			3.00m SILTY SILICEOUS SAND: Grey and pale yellow, medium grained sand, sub-angular.		VD		
				3.43m			SM					
								4.00m CLAY: Grey, mottled pale brown and red, high plasticity. with fissuring up to 5mm throughout.	M			
				4.50m SPT 4, 5, 6 N*=11						VSt		
				4.95m								
							CH					
				6.00m U63	6.0					H	6.00: 0.5m recovery	
				6.50m							6.50: Hand vane (Su) > 240 kPa	
								7.00m SANDY CLAY: Pale grey mottled yellow brown, medium plasticity. sand is medium grained, sub-rounded silica.		VSt		
				7.50m SPT 3, 8, 7 N*=15			CI					
				7.95m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S4 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S4

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347082.800, N: 5763087.200 (55 MGA94)

SURFACE ELEVATION : -6.540 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen



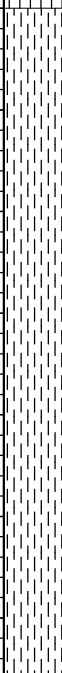
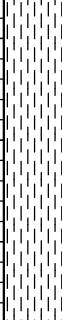
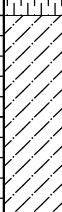
DATE STARTED : 11/1/14

DATE COMPLETED : 15/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					8.0		CI	SANDY CLAY: Pale grey mottled yellow brown, medium plasticity. sand is medium grained, sub-rounded silica. <i>(continued)</i>				
					8.50m			SILTY CLAY: Pale grey mottled pale brown, high plasticity. with medium grained, angular gravel of ironstone, and some fine grained silica sand.				
				9.05m SPT 4, 3, 4 N*=7	9.0		CH			Vst	9.00: U63 refusal at 9.0m, 50mm penetration D	
				9.50m								
					10.0			CLAYEY SILT: Brown, high plasticity. with poorly developed fissuring (<5mm) and trace organics.				
				10.50m SPT 0, 0, 1 N*=1						St	10.50: Soil is assessed as Stiff despite low SPT N value	
				10.95m				from 11.0m with some medium to coarse grained sub-angular silica sand			10.90: HP In-situ =100 kPa; (pocket penetrometer) 11.00: U63 attempted but returned empty	
				11.50m U63			MH					
				12.00m	12.0						12.00: HP In-situ =250 kPa; (pocket penetrometer) Hand vane refusal 12.20: Note: material is very stiff in undisturbed state but has low remoulded strength	
				12.50m SPT 3, 4, 5 N*=9						Vst		
				12.95m				at 12.95m fine grained angular gravel of cemented sand				
					13.0							
				13.30m				SILT: Brown, high plasticity. with trace fine organic material.				
				13.50m SPT 1, 3, 6 N*=9								
				13.95m	14.0		MH			Vst		
				15.00m SPT 5, 22, 28 N*=50	15.0			SAND: Grey, fine to medium grained sand. with silt, fine to medium carbonate shells and shell fragments.				
				15.45m			SM			VD		

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S4 Page 2 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S4

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347082.800, N: 5763087.200 (55 MGA94)

SURFACE ELEVATION : -6.540 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 11/1/14

DATE COMPLETED : 15/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL					
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
				SPT 7, 12, 18 N*=30	24.0			SAND: Grey, fine to medium grained sand, with silt, fine to medium carbonate shells and shell fragments. (continued) at 24.0m with only trace carbonate shell content		
				24.45m						
					25.0					
				25.50m SPT 17, 17, 24 N*=41						
				25.95m	26.0					
					27.0					
				27.00m SPT 12, 25, 25 N*=50			SM			
				27.45m						
					28.0					
				28.50m SPT 5, 13, 21 N*=34						
				28.95m	29.0					
					30.0					
				30.00m SPT 3, 8, 17 N*=25				SANDY SILT: Grey to green, low plasticity. Fine grained, silica sand, with trace fine to medium sand-sized shell fragments.		
				30.45m						
					31.0					
				31.50m SPT 3, 7, 14 N*=21			ML			
				31.95m	32.0					
										30.50: Field pH = 7.42

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S4 Page 4 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S4

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347082.800, N: 5763087.200 (55 MGA94) SURFACE ELEVATION : -6.540 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 11/1/14 DATE COMPLETED : 15/1/14 DATE LOGGED : LOGGED BY : J. Hixson CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					32.0			SANDY SILT: Grey to green, low plasticity. Fine grained, silica sand. with trace fine to medium sand-sized shell fragments. <i>(continued)</i>				
				33.00m SPT 3, 7, 16 N*=23	33.0					Vst		
				33.45m								
					34.0							
				34.50m SPT 1, 9, 25 N*=34								
				34.95m								
					35.0							
				36.00m SPT 6, 16, 26 N*=42	36.0		ML		M			
				36.45m								
					37.0					H		
				37.50m SPT 5, 13, 20 N*=33								
				37.95m								
					38.0							
				39.00m SPT 3, 11, 25 N*=36	39.0							
				39.45m								
				40.00m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S4

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347082.800, N: 5763087.200 (55 MGA94)

SURFACE ELEVATION : -6.540 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 11/1/14

DATE COMPLETED : 15/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 4, 9, 23 N*=32	40.0			SANDY SILT: Grey to green, low plasticity. Fine grained, silica sand. with trace fine to medium sand-sized shell fragments. <i>(continued)</i>			
				40.45m 40.90m							
					41.0						
					42.00m						
				42.50m SPT 6, 12, 24 N*=36						H	
				42.95m	43.0						
					43.50m						
					44.0		ML		M		
					45.0						
				45.00m SPT 1, 6, 22 N*=28							
				45.45m							
					46.0					VSI	
				46.50m SPT 6, 9, 18 N*=27							
				46.95m	47.0						
					48.00m					H	

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

WorleyParsons Services Pty Ltd



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Consulting

FINAL Rev 0

File: 301010-01290 S4 Page 6 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S4

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 7 OF 7

POSITION : E: 347082.800, N: 5763087.200 (55 MGA94) SURFACE ELEVATION : -6.540 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 11/1/14 DATE COMPLETED : 15/1/14 DATE LOGGED : LOGGED BY : J. Hixson CHECKED BY : C Pilkington

DRILLING							MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>HWT</div><div></div></div>				SPT 6, 10, 25 N*=35	48.0		ML	SANDY SILT: Grey to green, low plasticity. Fine grained, silica sand. with trace fine to medium sand-sized shell fragments. (continued) from 48.0m with shell fragments up to 5mm	M	H			
			48.45m										
			49.50m										
			SPT 7, 13, 25 N*=38	49.0									
				49.95m	49.95m			BOREHOLE S4 TERMINATED AT 49.95 m			49.95: Borehole backfilled with cement grout		
					50.0								
					51.0								
					52.0								
					53.0								
					54.0								
					55.0								
					56.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S4 Page 7 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S5

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346398.600, N: 5763050.900 (55 MGA94)

SURFACE ELEVATION : -2.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 25/1/14

DATE COMPLETED : 29/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S5 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S5

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346398.600, N: 5763050.900 (55 MGA94)

SURFACE ELEVATION : -2.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

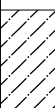

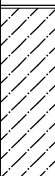

DATE STARTED : 25/11/14

DATE COMPLETED : 29/11/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					8.0		SM	SILTY SAND: Dark brown to black, fine to coarse grained sand. fines are low plasticity. (continued)		Vst	7.95: Hand vane (Su) = 180kPa Residual = 60kPa Sensitivity = 3	
					8.50m			SANDY CLAY: Dark grey mottled pale grey, high plasticity. Medium and coarse, subrounded silica sand. with trace fine grained rounded silica gravel.			8.50: driller reports 'harder ground' from 8.50m	
				9.00m SPT 3, 0, 3 N=3	9.0		CL			St	9.00: HP In-situ = 150kPa; (pocket penetrometer) ES Soil is assessed as Stiff despite low SPT N value	
				9.45m 9.50m U63								
				10.00m	10.0		SM	SILTY SAND: Dark grey, fine to coarse grained sand. with clay. at 10.0m: thin band (10mm) of weakly cemented sand, fine grained, pale brown silica		MD	10.00: Hand vane (Su) = 120kPa Driller reports hard layers in sequence	
				10.50m SPT 1, 4, 9/100mm N=R							10.50: Hammer bouncing	
				10.90m	11.0			at 10.9m: approximately 100mm thick cemented horizon				
					11.50m							
				12.00m SPT 1, 4, 6 N=10	12.0		ML	SILT: Dark grey, low plasticity. with fine grained size cemented zones, with some clay.	M		12.00: HP In-situ = 150, =170, =160kPa; (pocket penetrometer) 12.20: ES	
				12.45m 12.50m U63							12.50: U63 refused after 200mm. Only 100mm recovery. Material disturbed. Not suitable for testing 12.60-12.70: D	
				12.70m				weakly cemented horizon				
					13.0							
				13.50m SPT 9, 4, 2 N=6				weakly cemented horizon		St	14.00: U63 refused after 200mm. Zero recovery	
				13.95m 14.00m U63	14.0							
				14.20m								
				15.00m SPT 9, 4, 7 N=11	15.0							
				15.45m								
					16.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S5

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346398.600, N: 5763050.900 (55 MGA94)

SURFACE ELEVATION : -2.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 25/1/14

DATE COMPLETED : 29/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER									
					16.0			SILT: Dark grey to green with pale brown mottle, low plasticity, with some fine to medium grained carbonate and silica sand and shell fragments up to 5mm, with some clay.		
				16.50m SPT 7, 6, 12 N=18			ML			
				16.95m	17.0					
								17.50m	Vst	
				18.00m SPT 7, 8, 13 N=21	18.0			SANDY SILT: Dark grey to green, low plasticity. Fine grained silica sand, with some fine to medium sized carbonate shell fragments..		18.00: weakly cemented zone
				18.45m						
					19.0					
				19.50m SPT 6, 14, 24 N=38				cemented horizon		19.50: No recovery in SPT. Blocked by cemented silty sand
				19.95m	20.0				M	
									H	
				21.00m SPT 7, 16, 24 N=40	21.0		ML			
				21.45m						
					22.0					
				22.50m SPT 1, 5, 13 N=18				from 22.5m: with trace of clay		
				22.95m	23.0				Vst	
				23.50m SPT 6, 6, 14 N=20						
				23.95m 24.00m	24.0					

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S5 Page 3 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S5

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346398.600, N: 5763050.900 (55 MGA94)

SURFACE ELEVATION : -2.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 25/1/14

DATE COMPLETED : 29/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
				SPT 5, 7, 12 N=19	24.0			SANDY SILT: Dark grey to green, low plasticity. Fine grained silica sand. with some fine to medium sized carbonate shell fragments.. <i>(continued)</i>				
				24.45m				at 24.5m: 15mm thick shell-rich horizon				
				25.50m								
				SPT 6, 6, 14 N=20	25.0			at 25.5m: very weakly cemented			25.50: HP In-situ =220 kPa; (pocket penetrometer)	
				25.95m	26.0							

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S5

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346398.600, N: 5763050.900 (55 MGA94)

SURFACE ELEVATION : -2.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 25/1/14

DATE COMPLETED : 29/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					32.0			SANDY SILT: Dark grey to green, low plasticity. Fine grained silica sand. with some fine to medium sized carbonate shell fragments.. <i>(continued)</i>				
				33.00m SPT 3, 7, 9 N=16	33.0						Vst	
				33.45m								
					34.0							
				34.50m SPT 3, 7, 12 N=19								
				34.95m	35.0							
				36.00m SPT 11, 15, 20 N=35	36.0		ML		M			
				36.45m						H		
					37.0			from 37.0m (approximately): with trace clay				
				37.50m SPT 5, 8, 15 N=23								
				37.95m	38.0							
										Vst		
				39.00m SPT 5, 8, 14 N=22	39.0							
				39.45m								

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S5

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346398.600, N: 5763050.900 (55 MGA94)

SURFACE ELEVATION : -2.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 25/1/14

DATE COMPLETED : 29/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					40.0			SANDY SILT: Dark grey to green, low plasticity. Fine grained silica sand. with some fine to medium sized carbonate shell fragments.. <i>(continued)</i>			
				40.50m SPT 4, 8, 12 N=20			ML			Vst	
				40.95m				CLAYEY SILT: Dark grey to brown, low plasticity. with trace fine grained silica sand.			
					41.0		ML				
								SANDY SILT: Dark green, low plasticity. White and pale brown, medium to coarse, angular carbonate sand. shell fragments weakly cemented.			
				42.00m SPT 20, 18/70mm N=R 42.22m	42.0					H	42.00: Hammer bouncing
					43.0						
				43.60m SPT 4, 12, 27 N=39				colour change to dark grey to green			43.60: HP In-situ = 420, = 405, =380kPa; (pocket penetrometer)
				44.05m	44.0				M	Vst - H	
							ML				
				45.00m SPT 20, 12/30mm N=R 45.18m	45.0			colour change to dark green			45.00: Hammer bouncing
											45.50: Slow progress with casing advancer to 45.5m
					46.0						
				46.50m SPT 25/130mm N=R 46.63m						H	46.50: Hammer bouncing after 19 blows
					47.0						47.00: Slow progress with casing advancer to 48.0m
								from 47.5m: assumed strong, cemented material			47.50: Very slow advances from 47.5m
				48.00m	48.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S5

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346398.600, N: 5763050.900 (55 MGA94)

SURFACE ELEVATION : -2.750 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen



DATE STARTED : 25/1/14

DATE COMPLETED : 29/1/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div>HWT</div><div></div></div>				SPT 20/70mm N=R 48.07m	48.0		ML	SANDY SILT: Dark green, low plasticity. White and pale brown, medium to coarse, angular carbonate sand. shell fragments weakly cemented. (continued)	M	H	48.00: Hammer bouncing after 12 blows	
					48.80m		SP	SAND: Pale brown to yellow, medium to coarse grained sand, sub-rounded. with some medium to coarse grained carbonate shell sand, with trace of silt.		D	48.80: Increase in rate of washbore advance	
					49.50m SPT 13, 14, 17 N=31							
				49.95m	49.95m	BOREHOLE S5 TERMINATED AT 49.95 m						49.95: Borehole backfilled with cement grout
					50.0							
					51.0							
					52.0							
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					70.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S6

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347134.800, N: 5762419.100 (55 MGA94)

SURFACE ELEVATION : -10.910 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Cook

DATE STARTED : 14/12/13

DATE COMPLETED : 19/12/13

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 S6 Page 1 OF 7

HOLE NO : S6

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 347134.800, N: 5762419.100 (55 MGA94)

SURFACE ELEVATION : -10.910 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Cook

DATE STARTED: 14/12/13

DATE COMPLETED : 19/12/13

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	STRUCTURE & Other Observations	
DRILLING & CASING	WATER	CONSISTENCY RELATIVE DENSITY										
					SPT 2, 6, 7 N=13	8.0			SILT: Brown, low plasticity. trace rare pockets (up to 5mm) of organic material.			
					8.45m							
						9.0						
					9.50m U63		ML		from 9.5m, very stiff	M		
					10.00m	10.0					Vst	
					11.00m U63	11.0						
					11.30m SPT 6, 6, 8 N=14				SILTY CLAY: Brown, medium plasticity. with some medium angular gravel of dark grey basalt.			11.40: ES
					11.75m		CI			M	Vst	
						12.0						
					12.50m SPT 6, 14, 21 N=35							
					12.95m	13.0			SILTY SILICEOUS SAND: Brown, fine grained sand. With shell fragments (2mm-10mm).			
					14.00m SPT 8, 16, 27 N=43	14.0						
					14.45m		SM			M	D	
						15.0						
					15.50m SPT 11, 20, 26 N=46							
					15.95m	16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S6

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347134.800, N: 5762419.100 (55 MGA94)

SURFACE ELEVATION : -10.910 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Cook

DATE STARTED : 14/12/13

DATE COMPLETED : 19/12/13

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
							16.0			SILTY SILICEOUS SAND: Brown, fine grained sand. With shell fragments (2mm-10mm). <i>(continued)</i>		D	
						16.50m SPT 14, 25, 25 N=50				from 16.5m onwards colour is grey-brown			
						16.95m	17.0					VD	16.90: ES
						18.00m SPT 10, 19, 28 N=47	18.0			from 18.0m onwards sand is grey, with pale brown mottle			
						18.45m						D	
							19.0						
						19.50m SPT 12, 22, 28/135mm N=R				19.5m, pocket of clayey, fine grained sand			
						19.94m	20.0		SM		M	VD	
						21.00m SPT 9, 16, 26 N=42	21.0			from 21.0m onwards, only trace fine grained sand-sized shell fragments			
						21.45m							
							22.0						
						22.50m SPT 9, 23, 27/130mm N=R						D	
						22.93m	23.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 S6 Page 3 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S6

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347134.800, N: 5762419.100 (55 MGA94)

SURFACE ELEVATION : -10.910 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Cook

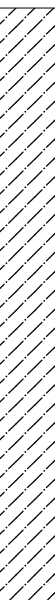

DATE STARTED : 14/12/13

DATE COMPLETED : 19/12/13

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
WB CASING				SPT 8, 12, 24 N=36	24.0		SM	SILTY SILICEOUS SAND: Brown, fine grained sand. With shell fragments (2mm-10mm). (continued)	M	D	
				24.45m							
				25.00m							
			SPT 4, 10, 21 N=31	25.50m							
				25.95m							
				26.00m							
				26.45m							
				27.00m							
			SPT 5, 11, 22 N=33	27.00m							
				27.45m							
			28.00m								
			28.50m		28.50m		SP	SILICEOUS SAND: Grey, fine grained sand. trace fine carbonate shell fragments.	M	D	
			28.95m								
			29.00m								
			29.45m								
			30.00m								
		SPT 4, 11, 25 N=36	30.00m								
			30.45m								
			31.00m								
			31.45m								
			31.50m								
		SPT 6, 10, 25 N=35	31.50m								
			31.95m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
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FINAL Rev 0

File: 301010-01290 S6 Page 4 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S6

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347134.800, N: 5762419.100 (55 MGA94)

SURFACE ELEVATION : -10.910 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Cook

DATE STARTED : 14/12/13

DATE COMPLETED : 19/12/13

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					32.0			SILICEOUS SAND: Grey, fine grained sand. trace fine carbonate shell fragments. <i>(continued)</i>	M	D	
				33.00m SPT 8, 24, 26/135mm N=R	33.0						
				33.44m							
					34.0	SP					
				34.50m SPT 5, 12, 24 N=36						VD	
				34.95m	35.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S6

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347134.800, N: 5762419.100 (55 MGA94)

SURFACE ELEVATION : -10.910 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Cook

DATE STARTED : 14/12/13

DATE COMPLETED : 19/12/13

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL							
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
						40.0			SANDY SILT: Grey to dark green, low plasticity. Fine grained silica sand. trace fine to coarse grained sand-sized carbonate shell fragments. <i>(continued)</i>			
					40.50m SPT 4, 8, 15 N=23							
					40.95m							
						41.0						
								ML		M	Vst	
					42.00m SPT 5, 9, 11 N=20	42.0			with some shell fragments up to 10mm			
					42.45m							
						43.0						
					43.50m SPT 4, 8, 13 N=21							
					43.95m	44.0		SM		M	MD	
					45.00m SPT 15, 35, 8/20mm N=R 45.32m	45.0			SILTY SILICEOUS SAND: Dark grey to green, fine grained sand. with shell fragments to 2mm, Weakly cemented.			45.00: 5 x double bounce
						46.0						
					46.50m SPT 18, 29, 5/10mm N=R 46.81m			SM		M	VD	46.50: 5 x double bounce
						47.0						
					48.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S6

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 347134.800, N: 5762419.100 (55 MGA94)

SURFACE ELEVATION : -10.910 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Cook


DATE STARTED : 14/12/13

DATE COMPLETED : 19/12/13

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING							MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>WB</div><div>CASING</div><div></div></div>				SPT 10, 12, 23 N=35	48.0		SP	SILTY SILICEOUS SAND: Pale grey to green, medium grained sand. with some medium grained shell fragments.	M	D			
			48.45m										
			49.50m										
			49.95m										
				SPT 12, 17, 19 N=36									
					50.0			BOREHOLE S6 TERMINATED AT 49.95 m			49.95: Borehole backfilled with cement grout		
					51.0								
					52.0								
					53.0								
					54.0								
					55.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S6 Page 7 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S7

FILE / JOB NO : 301010-01290

SHEET : 1 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346456.220, N: 5762361.290 (55 MGA94)

SURFACE ELEVATION : -8.660 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 8/2/14

DATE COMPLETED : 12/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL									
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations			
DRILLING & CASING	WATER														
↑				SPT 0, 0, 0 N=0	0.0		SP	SILICEOUS SAND: Brown, fine to medium grained sand, with trace silt and trace shell fragments (description from grab sample).	W	VL		0.00: Rods penetrated under self weight, no sample recovered			
			0.45m 0.50m SPT 2, 3, 6 N=9												0.50: Windowless sample returned empty with 2 attempts At 0.5m SPT through disturbed material to retrieve ES. Blow count not representative of in situ density ES pH = 7.93
			0.95m 1.00m SPT 0, 0, 0 N=0												
				1.45m		SC	CLAYEY SAND: Dark grey to black, fine to medium grained sand, with carbonate shell fragments and shells up to 50mm.	L		1.50: U63 tube attempted, no sample recovered Piston sample attempted, no recovery					
			2.00m P												
			2.45m												
				3.00m SPT 4, 6, 10 N=16		SM	SILTY SILICEOUS SAND: Dark grey, fine to medium grained sand, sub-rounded, with trace carbonate shell fragments.	VL		3.00: ES					
			3.45m 3.50m U63												
			3.95m												
				4.50m SPT 9, 12, 15 N=27		SP-SM	SILICEOUS SAND: Dark brown, fine grained sand, sub-rounded, with trace coarse grained, angular silica silt.	M		MD		3.95: Hand vane could not penetrate base of sample Driller notes low torque and water pressure (assumed sand)			
			4.95m												
			6.00m SPT 2, 3, 3 N=6												
				6.45m		SC	CLAYEY SILICEOUS SAND: Dark grey, fine grained sand, sub-rounded, trace coarse grained, angular silica.	L							
			7.00m												
			7.50m SPT 1, 2, 6 N=8												
			7.95m		SM	SILTY SILICEOUS SAND: Dark grey, fine grained sand, sub-rounded, with trace fine grained carbonate shell fragments, trace clay.									

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S7 Page 1 OF 8

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S7

FILE / JOB NO : 301010-01290

SHEET : 2 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346456.220, N: 5762361.290 (55 MGA94)

SURFACE ELEVATION : -8.660 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


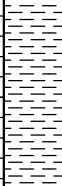


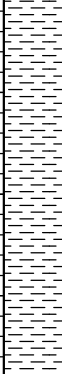
DATE STARTED : 8/2/14

DATE COMPLETED : 12/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SM	SILTY SILICEOUS SAND: Dark grey, fine grained sand, sub-rounded. with trace fine grained carbonate shell fragments, trace clay. <i>(continued)</i>		L	
				9.00m SPT 2, 4, 8 N=12	8.50m		ML	SANDY SILT: Dark brown, low plasticity. Fine grained silica sand. with fine to medium carbonate shell fragments.		st	9.45: HP In-situ =150 kPa; (pocket penetrometer)
				9.45m							
					10.0		CI	CLAY: Pale grey and brown, medium plasticity. with some fine to medium grained silica sand.		vst	10.50: Hand vane (Su) = 160kPa
				10.50m U63							
				11.00m							11.00: Driller reports hard layers during washbore advance
					11.0						
					11.50m						
				12.00m U63	12.0		MH	SILT: Dark brown, high plasticity. with trace fine grained silica sand.	M		12.00: U63 300mm recovery
				12.50m							12.50: Hand vane (Su) = 180kPa
					13.0						
				13.50m U63				SILT: Dark grey, low plasticity. with trace fine grained silica sand, with weakly cemented horizons.			
				14.00m	14.0		ML			H	14.00: Hand vane (Su) = 210kPa
				15.00m U63	15.0						15.00: U63 tube refusal after 350mm
				15.35m							15.35: Hand vane refusal on cemented band
					16.00m						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S7 Page 2 OF 8

HOLE NO : S7

FILE / JOB NO : 301010-01290

SHEET : 3 OF 8

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 346456.220, N: 5762361.290 (55 MGA94)

SURFACE ELEVATION : -8.660 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen



DATE STARTED : 8/2/14

DATE COMPLETED : 12/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					16.0		ML	SANDY SILT: Dark grey to green, low plasticity. Fine grained silica sand. trace fine to medium grained carbonate shell fragments.			
				16.50m SPT 5, 40, 10/80mm N=R				at 16.7m cemented horizon, approximately 80mm thick			
				16.88m							
					17.0						
								17.50m			16.50: Hammer bouncing from 9 to 21 in second drive
							SM	SILTY SAND: Dark grey to green, fine grained sand. trace fine grained carbonate shell fragments.	M		17.50: Loss of circulation from approximately 17.5m
				18.00m SPT 9, 18, 28 N=46							
				18.45m							
				19.50m SPT 10, 17, 27 N=44							
				19.95m							
					20.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S7

FILE / JOB NO : 301010-01290

SHEET : 4 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346456.220, N: 5762361.290 (55 MGA94)

SURFACE ELEVATION : -8.660 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen









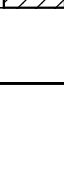
DATE STARTED : 8/2/14

DATE COMPLETED : 12/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
HWT				SPT 8, 17, 23 N=40	24.0		SM	SILTY SAND: Dark grey to green, fine grained sand. trace fine grained carbonate shell fragments. (continued)	M	D	24.00: SPT required over drilling to remove spoon	
			24.45m									
				25.0		25.00m	SILTY SILICEOUS SAND: Grey, fine grained sand. trace fine to medium shell fragments, with trace clay.					
			25.50m									
			SPT 5, 11, 17 N=28									
			25.95m									
				26.0								
				27.0								
			27.00m									
			SPT 5, 10, 22 N=32									
			27.45m									
				28.0								
		28.50m			SM							
		SPT 5, 12, 26 N=38										
		28.95m	29.0									
			30.0									
		30.00m										
		SPT 5, 10, 22 N=32										
		30.45m										
			31.0									
		31.50m										
		SPT 4, 8, 21 N=29										
		31.95m	32.0									
			33.0									

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S7 Page 4 OF 8

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S7

FILE / JOB NO : 301010-01290

SHEET : 5 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346456.220, N: 5762361.290 (55 MGA94)

SURFACE ELEVATION : -8.660 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 8/2/14

DATE COMPLETED : 12/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					32.0			SILTY SILICEOUS SAND: Grey, fine grained sand. trace fine to medium shell fragments, with trace clay. <i>(continued)</i>		MD	
				33.00m SPT 3, 9, 21 N=30	33.0		SM			D	
				33.45m							
					34.0			34.00m			
				34.50m SPT 3, 5, 19 N=24				SILT: Grey-green, low plasticity. with fine to medium sand, and trace fine carbonate shell fragments and shells up to 15mm.		VSt	
				34.95m							
					35.0						
				36.00m SPT 4, 8, 25 N=33	36.0			from 37.0m with trace clay		H	
				36.45m							
					37.0		ML				
				37.50m SPT 2, 6, 14 N=20							
				37.95m	38.0					VSt	
				39.00m SPT 3, 5, 12 N=17	39.0						
				39.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S7

FILE / JOB NO : 301010-01290

SHEET : 6 OF 8

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346456.220, N: 5762361.290 (55 MGA94)

SURFACE ELEVATION : -8.660 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 8/2/14

DATE COMPLETED : 12/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL							
PROGRESS		DRILLING & CASING	WATER	PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
							40.0			SILT: Grey-green, low plasticity, with fine to medium sand, and trace fine carbonate shell fragments and shells up to 15mm. <i>(continued)</i>		Vst	
						40.50m SPT 3, 9, 12 N=21							
						40.95m				very weakly cemented zone approximately 80mm thick		H	
						42.00m SPT 5, 11, 24 N=35	42.0				M	Vst	
						42.45m							
							43.0						
						43.50m SPT 6, 8, 15 N=23			ML				
						43.95m	44.0						
						45.00m SPT 5, 11, 16 N=27	45.0					Vst	
						45.45m							
							46.0						
						46.50m SPT 7, 12, 17 N=29							
						46.95m	47.0			47.00m			47.00: from 47m approximately, slower progress of washbore advance
						47.50m SPT 20, 35/130mm N=R 47.78m			SP	SILICEOUS SAND: Dark green, fine grained sand. yellow fine to coarse shell fragments, with some silt, weakly cemented.		VD	47.50: Hammer bouncing after 21 blows in first drive
										48.00m			

See Explanatory Notes for details of abbreviations & basis of descriptions.

Continued as Cored Drill Hole

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File: 301010-01290 S7 Page 6 OF 8

CORED DRILL HOLE LOG

HOLE NO : S7

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346456.220, N: 5762361.290 (55 MGA94)

SURFACE ELEVATION : -8.660 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 8/2/14

DATE COMPLETED : 12/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

CASING DIAMETER :

BARREL (Length) : 1.50 m BIT : HQ - 9 IMPREGNATED BIT

BIT CONDITION : Good

DRILLING				MATERIAL				FRACTURES			
PROGRESS	DRILLING & CASING	WATER	LOSS (RUN %)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	Weathering	ESTIMATED STRENGTH (s(50))	NATURAL FRACTURE (mm)	ADDITIONAL DATA
							ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable) START CORING AT 48.00m				(joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
			50% LOSS	Is(50) i=0.12 MPa Is(50) d=0.8 MPa	48.0		SILICEOUS SAND (SP): Cemented, dark green, fine to coarse yellow carbonate shell fragments, with silica, very weakly cemented, with interbeds of uncemented sand.				48.00: Run 1: 48.0-49.5m (15 mins) TCR = 0.75m SCR = 0.75m RQD = 16% Sand interbeds washed out by drilling
			0% LOSS		49.50		SILICEOUS SAND (SP): Cemented, pale grey to green, fine grained sand, trace fine grained carbonate, cement is silica, very weak.				49.50: Run 2: 49.5-50.25m (15 mins) TCR = 0.75m SCR = 0.75m RQD = 0.45m
			0% LOSS		50.25		SILICEOUS SAND (SP): Pale grey to green, fine grained sand, trace fine carbonate, with some shell fragments to 20mm, with silt, dense, dense				50.25: Run 3: 50.25-51.0m (15 mins) TCR = 0.75m SCR = 0.75m RQD = 100%
			0% LOSS		51.00						51.00: Run 4: 51.0-52.5m (20 mins) TCR = 1.5m SCR = 0m (soil)
					51.55m						
					51.75m						
			0% LOSS		52.50						52.50: Run 5: 52.5-54.0m (20 mins) TCR = 1.5m SCR = 0m (soil)
			0% LOSS		54.00		from 54.4 becoming medium to coarse grained, sub-rounded silica sand				54.00: Run 6: 55.0-55.0m (10 mins) TCR = 1.0m SCR = 0m (soil)
			0% LOSS		55.00		BOREHOLE S7 TERMINATED AT 55.00 m				55.00: Borehole backfilled with cement grout

See Explanatory Notes for details of abbreviations & basis of descriptions.

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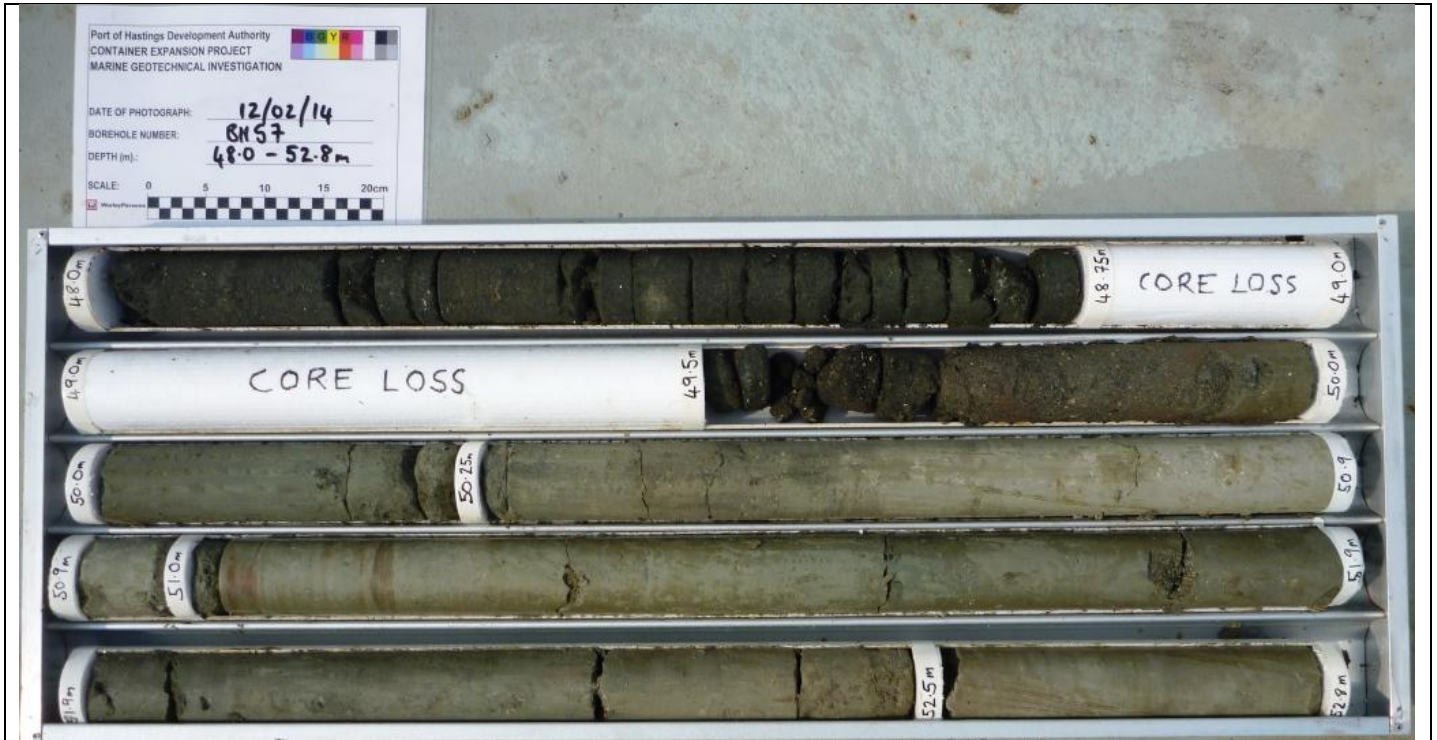


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AGS_3_1 RTA_1_1 UB 08.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ <<DrawingFile>> 13/09/2014 10:24

FINAL Rev 0

File: 301010-01290 S7 7 OF 7



S7 – 48.0m to 52.8m



S7 – 52.8m to 55.0m

HOLE NO : S8

FILE / JOB NO : 301010-01290

FILE / JOB NO. : 3
SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 345391.620, N: 5762609.130 (55 MGA94)

SURFACE ELEVATION : 0.880 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 9/4/14

DATE COMPLETED : 11/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		WATER	PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING													
PWT					P	0.0		SM	0.10m	SILTY SILICEOUS CARBONATE SAND: Dark grey, fine to medium grained sand. with some shells up to 15mm in size, trace plant material.	W	VL	0.00: ES & G (taken using grab) pH = 7.55
					0.20m			CI		SANDY CLAY: Brown, medium plasticity. Fine to medium grained, sub-angular carbonate and silica sand. trace shells up to 5mm in size.		H	Piston sample refused after 200mm 0.20: HP In-situ =450 - =500 kPa; (pocket penetrometer)
					0.50m				0.50m				
					U63					CLAYEY SILICEOUS SAND: Pale grey and brown mottled, fine to coarse grained sand, sub-angular.			
					0.90m								
					1.00m								
					SPT 5, 5, 5 N=10		SC				M		1.00: ES pH = 7.62
					1.45m								
							2.0			2.00m	SILTY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-angular.		
HWT					2.50m							MD	
					SPT 11, 14, 11 N=25								
					2.95m								
								SM		from 3.5m sand is fine to coarse grained			
					4.00m								
					SPT 7, 9, 14 N=23								
					4.45m								
							5.0			5.00m	CLAYEY SAND: Dark grey, fine to medium grained sand, sub-angular.	W	
					5.50m							L	
					SPT 3, 1, 4 N=5								
					5.95m								
								SC		grey from 6.5m			
					7.00m							MD	
					SPT 3, 8, 6 N=14								
					7.45m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S8

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345391.620, N: 5762609.130 (55 MGA94)

SURFACE ELEVATION : 0.880 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 9/4/14

DATE COMPLETED : 11/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
						8.0			CLAYEY SAND: Dark grey, fine to medium grained sand, sub-angular. <i>(continued)</i>				
					8.50m SPT 2, 0, 0 N=0								
					8.95m			SC	At 8.7m 30mm layer of fine grained, sub-rounded to sub-angular, silica gravel	W	VL		
						9.0							
					10.00m SPT 0, 0, 0 N=0				10.00m				
					10.45m 10.50m U63			CI	SILTY CLAY: Dark brown, medium plasticity.		St	10.00: Soil is assessed as Stiff despite low SPT N value	
					10.95m							10.90: ES 10.95: Hand vane (Su) = 110kPa Residual shear = 30kPa	
						11.0							
									11.50m				
					12.00m U63	12.0			SANDY SILT: Dark grey, low plasticity. Fine grained sand.				
					12.45m			ML			Vst	12.40: ES 12.45: Hand vane (Su) = 156kPa Residual shear = 40kPa	
						13.0				M			
					13.50m U63								
					13.90m				SILTY SAND: Grey-pale grey, fine to medium grained sand. trace shells up to 3mm in size, with zones of clay-rich material.				
						14.0							
									from 14.5m sand is fine grained				
					15.00m SPT 4, 6, 11 N=17	15.0		SM			MD		
					15.45m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S8 Page 2 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S8

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345391.620, N: 5762609.130 (55 MGA94)

SURFACE ELEVATION : 0.880 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 9/4/14

DATE COMPLETED : 11/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					32.0			SANDY SILT: Grey, low plasticity. Fine grained sand. trace shells up to 10mm in size. <i>(continued)</i>			
				33.00m SPT 3, 5, 10 N=15	33.0						
				33.45m							
					34.0						
				34.50m SPT 4, 5, 12 N=17							
				34.95m							
					35.0						
				36.00m SPT 4, 5, 13 N=18	36.0		ML			M	Vst
				36.45m							
					37.0						
				37.50m SPT 5, 7, 8 N=15							
				37.95m							
					38.0						
				39.00m SPT 6, 7, 12 N=19	39.0						
				39.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S8 Page 5 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S8

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345391.620, N: 5762609.130 (55 MGA94)

SURFACE ELEVATION : 0.880 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

DATE STARTED : 9/4/14

DATE COMPLETED : 11/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
					40.0			SILTY SAND: Dark grey-olive, fine grained sand. with some shells up to 4mm in size, with some lumps of weakly cemented material.					
				40.50m SPT 17, 29, 21/60mm N=R 40.86m									
					41.0		SM				D		
				42.00m SPT 13, 15, 23 N=38	42.0								
				42.45m									
					43.0								
				43.50m SPT 10, 14, 18 N=32				SAND: Pale grey and pale brown mottled, fine grained sand. with some silt, trace shells up to 3mm in size.			D		
				43.95m	44.0								
								from 44.5m sand is fine to medium grained					
				45.00m SPT 6, 8, 13 N=21	45.0		SP				MD		
				45.45m									
					46.0								
				46.50m SPT 33, 26, 22 N=48				At 46.7m 10mm thick moderately cemented band			D	46.50: Piece of SPT snapped off and obstructed borehole, unable to penetrate using blade bit or rock roller. Change to HQ coring	
				46.95m	47.0								
								GRAVELLY SILICEOUS SAND: Olive-grey, fine to coarse grained sand, sub-rounded to sub-angular. Fine grained, sub-rounded, silica gravel. with some silt.					
					47.0		SP				MD		
				48.00m	48.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S8 Page 6 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S8

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345391.620, N: 5762609.130 (55 MGA94)

SURFACE ELEVATION : 0.880 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : N Russell

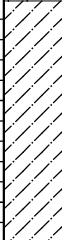

DATE STARTED : 9/4/14

DATE COMPLETED : 11/4/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
HQ CORING ↓				SPT 8, 9, 14 N=23	48.0		SM	From 47.97-48.01m: wood, dark brown SILTY SILICEOUS SAND: Grey-brown, fine to medium grained sand, sub-rounded, trace dark brown woody fragments up to 10mm in size.	W	MD		
			48.45m									
					49.50m SPT 8, 21, 29/110mm N=R	49.0			49.20m COAL: dark brown-dark grey, very low strength	M		
				49.91m	49.91m			BOREHOLE S8 TERMINATED AT 49.91 m			49.91: Borehole backfilled with cement grout	
					50.0							
					51.0							
					52.0							
					53.0							
					54.0							
					55.0							
					56.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S8 Page 7 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S9

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346488.420, N: 5761658.230 (55 MGA94)

SURFACE ELEVATION : -11.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper


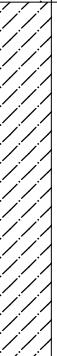


DATE STARTED : 24/2/14

DATE COMPLETED : 27/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
↑ PWT ↓				SPT 6, 15, 23 N=38	0.0		SP	SILICEOUS CARBONATE SAND: Brown, fine to coarse grained sand, sub-rounded to sub-angular. with some shells up to 20mm in size at the surface, with trace silt, with trace fine grained, sub-rounded silica gravel.			0.00: ES & G (taken from grab) pH = 7.81
			0.45m		0.70m						
↑ HWT ↓				1.00m SPT 6, 14, 18 N=32	1.0		SM	SILICEOUS CARBONATE SAND: Pale grey, fine to coarse grained sand, sub-rounded to sub-angular. with some silt.		D	1.00: ES pH = 7.22
			1.45m 1.50m U63		1.90m						
					2.0						
					2.50m						
				3.00m SPT 5, 9, 9 N=18	3.0		SC	CLAYEY SILICEOUS CARBONATE SAND: Dark brown, fine to medium grained sand, sub-rounded to sub-angular. with trace sub-rounded fine grained silica gravel.			
				3.45m							
					4.0						
				4.50m SPT 9, 12, 10 N=22	4.5						
				4.95m	5.0						4.90: ES
					5.30m						
				5.50m SPT 5, 7, 5 N=12	5.5		SC	CLAYEY SAND: Dark brown-black, fine grained sand. with some thick beds of medium to coarse grained, sub-rounded gravelly silica sand, gravel is fine grained, sub-rounded silica.			
				5.95m	6.0				from 6.0m no gravelly sand bands observed		
				6.50m SPT 1, 1, 3 N=4	6.5						
				6.95m	7.0						
				8.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S9 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S9

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346488.420, N: 5761658.230 (55 MGA94)

SURFACE ELEVATION : -11.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 24/2/14

DATE COMPLETED : 27/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
				SPT 5, 6, 7 N=13	8.0		SC	8.20m	W	L			
				8.45m			SC	CLAYEY SILICEOUS SAND: Dark brown, fine to coarse grained sand, sub-angular.		MD			
				9.50m SPT 4, 5, 6 N=11			SC	9.70m					
				9.95m 10.00m U63	10.0		CI	SANDY CLAY: Dark grey, medium plasticity. Fine grained, silica sand.		St	9.90: ES		
				10.40m				10.70m			10.40: Hand vane (Su) = 82kPa		
				11.00m U63 11.08m	11.0			SILTY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-rounded to sub-angular. moderately weakly cemented.			11.00: U63 tube refusal after 80mm 11.08: Hammer bouncing, no sample recovered		
				12.50m SPT 4, 7, 8 N=15	12.0		SM	from 12.0m dark grey	M	D			
				12.95m	13.0			13.50m					
				14.00m SPT 3, 7, 13 N=20	14.0		SM	SILTY SAND: Grey, fine grained sand. with trace white shells up to 10mm in size.					
				14.45m						MD			
				15.50m SPT 5, 9, 14 N=23	15.0		SM	SILTY SILICEOUS CARBONATE SAND: Grey-olive, fine to coarse grained sand, sub-rounded. with some shells up to 4mm in size, with trace fine grained, sub-rounded silica gravel, weakly cemented.					
				15.95m									

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S9 Page 2 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S9

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346488.420, N: 5761658.230 (55 MGA94)

SURFACE ELEVATION : -11.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 24/2/14

DATE COMPLETED : 27/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					16.0			SILTY SILICEOUS CARBONATE SAND: Grey-olive, fine to coarse grained sand, sub-rounded, with some shells up to 4mm in size, with trace fine grained, sub-rounded silica gravel, weakly cemented. <i>(continued)</i>		MD	
				17.00m SPT 2, 0, 5 N=5	17.0		SM			L	
				17.45m							
					18.0			18.00m SILTY SILICEOUS CARBONATE SAND: Grey-olive, fine to medium grained sand, with some shells up to 4mm in size.		VL	
				18.50m SPT 2, 2, 1 N=3			SM				
				18.95m							
					19.0						
								19.50m SILTY SAND: Grey, fine grained sand, with some carbonate nodules up to 2mm in size.		D	
				20.00m SPT 8, 18, 26 N=44	20.0				M		
				20.45m							
					21.0						
				21.50m SPT 4, 9, 18 N=27			SM				
				21.95m							
					22.0					MD	
				23.00m SPT 10, 4, 9 N=13	23.0						
				23.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S9 Page 3 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S9

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346488.420, N: 5761658.230 (55 MGA94)

SURFACE ELEVATION : -11.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

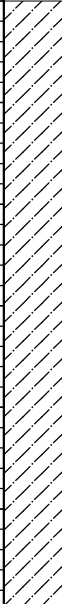
DATE STARTED : 24/2/14

DATE COMPLETED : 27/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
						24.0		SM	SILTY SAND: Grey, fine grained sand. with some carbonate nodules up to 2mm in size. <i>(continued)</i>		D	
				24.50m SPT 5, 11, 22 N=33								
				24.95m								
						25.0						
						</						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S9 Page 4 OF 7

HOLE NO : S9

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 346488.420, N: 5761658.230 (55 MGA94)

SURFACE ELEVATION : -11.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

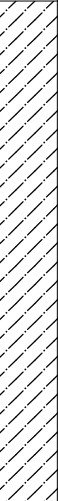
DRILLER : T Harper

DATE STARTED : 24/2/14

DATE COMPLETED : 27/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING							MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
				SPT 6, 12, 29 N=41	32.0		SM	SILTY SILICEOUS SAND: Grey, fine grained sand. with trace shells up to 2mm in size. (continued)		D		
				32.45m								
					33.0							
				33.50m SPT 6, 13, 25 N=38								
				33.95m								
					34.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S9

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346488.420, N: 5761658.230 (55 MGA94)

SURFACE ELEVATION : -11.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 24/2/14

DATE COMPLETED : 27/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL								
PROGRESS		DRILLING & CASING	WATER	PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER									Soil Type, Colour, Plasticity or Particle Characteristic	Secondary and Minor Components			
							40.0			SILTY SILICEOUS SAND: Grey, fine grained sand. with trace shells up to 2mm in size. <i>(continued)</i>				
						41.00m SPT 6, 12, 22 N=34	41.0						D	
						41.45m								
							42.0							
						42.50m SPT 4, 11, 21 N=32								
						42.95m								
							43.0		SM					
						44.00m SPT 8, 26, 10/30mm N=R 44.33m	44.0					M		44.00: Hammer bouncing
							45.0			from 45.0m grey green				
						45.50m SPT 50/110mm N=R 45.61m							VD	
							46.0							
										46.60m SILTY SILICEOUS SAND: Pale grey, fine grained sand. moderately cemented.				
						47.00m SPT 50/60mm N=R 47.06m	47.0		SM					

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S9

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 346488.420, N: 5761658.230 (55 MGA94)

SURFACE ELEVATION : -11.270 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

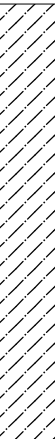
DATE STARTED : 24/2/14

DATE COMPLETED : 27/2/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div>HWT</div> <div>↓</div>				48.50m SPT 25/40mm N=R 48.54m	48.0		SM	SILTY SILICEOUS SAND: Pale grey, fine grained sand. moderately cemented. <i>(continued)</i>	M	VD	
				49.0							
			50.00m SPT 30/150mm N=R 50.15m	50.0							
							50.15m	BOREHOLE S9 TERMINATED AT 50.15 m			50.15: Borehole backfilled with cement grout
					51.0						
					52.0						
					53.0						
					54.0						
					55.0						
					56.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S9 Page 7 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S10

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345810.510, N: 5761598.900 (55 MGA94)

SURFACE ELEVATION : -6.450 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 13/2/14

DATE COMPLETED : 15/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL										
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations					
DRILLING & CASING	WATER															
↑	HWT			SPT 0, 0, 0 N=0	0.0		SP	SILICEOUS SAND: Brown, fine to medium grained sand, sub-rounded, with white, fine to coarse carbonate shell fragments, with some silt, with some shells up to 20mm. With trace marine bivalves and trace organics (description from grab sample).	M	VL	0.00: ES & G (taken from Grab)					
		0.45m	D	0.50: Windowless sample from 0.5-1.5m (0.8m recovery)												
		0.50m														
					0.70m		CI	SANDY CLAY: Pale grey, medium plasticity. Fine to medium grained, silica sand.		VSI	0.80: ES pH = 7.42					
				1.20: G												
		1.50m	U63	1.50: Hand vane (Su) = 160kPa												
		2.00m		2.00: Hand vane (Su) = 200kPa												
		3.00m	U63	3.50m	4.00m						SC	CLAYEY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-angular.	H	3.50: Hand vane refusal. Too stiff to push into sample		
		4.50m	U63	5.00m	6.00m	6.50m	SPT 4, 5, 6 N=11	6.95m		7.0		SP	SILICEOUS SAND: Pale grey, medium to coarse grained sand, sub-angular, with some clay and interbeds up to 30mm thick of brown and dark brown silty clay.	MD	4.50: Not suitable for hand vane test due to being too sandy	
		7.50m	SPT 2, 9, 15 N=24	7.95m												

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S10 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S10

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345810.510, N: 5761598.900 (55 MGA94)

SURFACE ELEVATION : -6.450 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 13/2/14

DATE COMPLETED : 15/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		SP	SILICEOUS SAND: Pale grey, medium to coarse grained sand, sub-angular, with some clay and interbeds up to 30mm thick of brown and dark brown silty clay. <i>(continued)</i>		MD	
					8.50m						
				9.00m U63	9.0		SC	CLAYEY SILICEOUS SAND: Brown, fine grained sand. At 9.0m: 100mm thick layer of silt and carbonate sandy silt nodules up to 20mm diameter	M	MD	9.00: Material loses strength upon remoulding
				9.50m							9.50: Hand vane (Su) = 156kPa Residual shear = 48kPa
					10.0						
				10.50m P				SILTY SILICEOUS SAND: Yellow-brown, fine grained sand, recovered as very loose, wet, with weakly cemented sand nodules up to 20mm diameter, and trace shls and shell fragments up to 10mmq.	W	VL	10.50: U63 fell under weight of rods. No recovery. Sample picked up with piston sampler, therefore will be disturbed
				11.00m SPT 13, 12, 9 N=21	11.0			From 10.9m (approx.): weakly cemented band 200mm thick			
				11.45m			SM				
				12.00m SPT 7, 8, 11 N=19	12.0						
				12.45m							
					13.0						
				13.50m U63			SM	SILTY SILICEOUS SAND: Brown-grey, fine grained sand, sub-angular, trace fine grained, carbonate shell sand, trace clay.	M	MD	
					13.70m						
				13.90m SPT 6, 11, 18 N=29	14.0			SILTY SILICEOUS SAND: Dark grey, fine grained sand, sub-angular, with fine grained, carbonate shell, and shells up to 20mm.			
				14.35m							
					15.0		SM				
				15.00m SPT 5, 10, 18 N=28							
				15.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S10 Page 2 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S10

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345810.510, N: 5761598.900 (55 MGA94)

SURFACE ELEVATION : -6.450 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 13/2/14

DATE COMPLETED : 15/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					16.0			SILTY SILICEOUS SAND: Dark grey, fine grained sand, sub-angular. with fine grained, carbonate shell, and shells up to 20mm. <i>(continued)</i>			
				16.50m SPT 6, 15, 21 N=36							
				16.95m							
					17.0						
								From 17.5m: becoming pale brown and grey			
				18.00m SPT 11, 20, 13/50mm N=R 18.35m	18.0		SM	Assumed cemented horizon		D	18.00: Hammer bouncing
					19.0						
				19.50m SPT 31, 13, 26 N=39				At 19.5m: 150mm thick weakly cemented horizon			
				19.95m				At 19.7: becoming dark grey-green At 19.8m: with abundant shell fragments up to 15mm diameter	M		20.00: Hammer bouncing
					20.0						
								20.50m			
				21.00m SPT 2, 7, 15 N=22	21.0		SC	CLAYEY SILICEOUS SAND: Dark grey, fine grained sand, sub-angular. with fine to coarse grained, carbonate shell fragments, with thin (<20mm) interbeds of sandy clay, stiff.		MD	
				21.45m							
					22.0						
				22.50m SPT 13, 22, 28 N=50				SILICEOUS SAND: Dark grey, fine grained sand, sub-angular. with white, fine to coarse grained carbonate shell fragments, with some silt.			
				22.95m							
					23.0		SP	At 22.9m: bed of sandy clay, grey-green, medium plasticity, sand is fine grained silica, very stiff		VD	

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S10 Page 3 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S10

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345810.510, N: 5761598.900 (55 MGA94)

SURFACE ELEVATION : -6.450 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

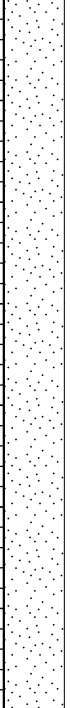
DATE STARTED : 13/2/14

DATE COMPLETED : 15/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING						MATERIAL							
PROGRESS		DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER												
						SPT 12, 18, 30 N=48	24.0		SP	SILICEOUS SAND: Dark grey, fine grained sand, sub-angular. with white, fine to coarse grained carbonate shell fragments, with some silt. <i>(continued)</i>	M	VD	
					24.45m								
					25.50m								
					SPT 6, 16, 25 N=41								
					25.95m								
					27.00m								
					SPT 6, 8, 20 N=28								
					27.45m								
									At 27.3m: band of sandy clay, approximately 50mm thick				
								</					

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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File: 301010-01290 S10 Page 4 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S10

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345810.510, N: 5761598.900 (55 MGA94)

SURFACE ELEVATION : -6.450 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 13/2/14

DATE COMPLETED : 15/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					32.0			SILTY SILICEOUS SAND: Dark grey, fine grained sand, trace fine grained carbonate shell fragments, trace clay. <i>(continued)</i>	M	MD	
				33.00m SPT 3, 5, 11 N=16	33.0						
				33.45m							
					34.0						
				34.50m SPT 3, 6, 19 N=25							
				34.95m							
					35.0	SM					
				36.00m SPT 4, 9, 19 N=28	36.0						
				36.45m							
					37.0						
				37.50m SPT 3, 5, 15 N=20							
				37.95m			at 37.8m: with shells up to 10mm				
					38.0						
							38.50m	SANDY SILT: Dark grey-green, low plasticity. Fine grained, silica sand, trace fine grained carbonate shells, with trace shells up to 15mm diameter.		H	
				39.00m SPT 3, 6, 11 N=17	39.0	ML					
				39.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

HOLE NO : S10

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 345810.510, N: 5761598.900 (55 MGA94)

SURFACE ELEVATION : -6.450 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 13/2/14

DATE COMPLETED : 15/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : L Missen

DRILLING							MATERIAL					
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
<div>HWT</div> <div>SANDY SILT: Dark grey-green, low plasticity. Fine grained, silica sand. trace fine grained carbonate shells, with trace shells up to 15mm diameter. <i>(continued)</i></div> <div>M</div> <div>H</div> <div>From 46.0m: with trace clay</div>												

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S10

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345810.510, N: 5761598.900 (55 MGA94)

SURFACE ELEVATION : -6.450 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

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DATE STARTED : 13/2/14

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DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

HOLE NO : S11

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 345862.700, N: 5760917.700 (55 MGA94)

SURFACE ELEVATION : -8.020 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 16/12/13

DATE COMPLETED : 7/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		WATER	PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING												
PQT					ES 0.10m	0.0		SW	SAND: Brown, fine to coarse grained sand. sub-rounded to sub-angular quartz, with some shells <30mm diameter.	W	VL	1.85: Hand vane (Su) = 190 kPa
					D 0.50m				SILTY CLAY: Pale brown and pale grey mottled, high plasticity. with some fine to medium grained sub-angular to sub-rounded quartz sand.	M	F	
					ES 0.80m							
					D 1.00m	1.0					St	
					U63 1.50m		CH	with trace of fine to medium grained sand				
					ES 1.85m 1.90m	2.0					VSI	
						U63 3.00m	3.0	CH	SANDY CLAY: Pale grey, high plasticity. Fine to medium grained, sub-rounded to sub-angular siliceous sand.	W	VD	
					ES 3.40m 3.45m		SC	CLAYEY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-rounded to sub-angular.				
						4.0			SILICEOUS SAND: Pale grey, fine to coarse grained sand, sub-angular. with silt.			4.40: ES
					SPT 19, 34, 50 N=84 4.95m	5.0				VD		
					SPT 15, 15, 22 N=37 6.00m	6.0	SM		W			
					6.45m					D	6.40: ES	
					SPT 6, 5, 3 N=8 7.50m	7.0						
					7.85m		ML	SANDY SILT: Dark grey, low plasticity. Sand is fine grained sand.	W		7.85: ES	

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S11

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345862.700, N: 5760917.700 (55 MGA94)

SURFACE ELEVATION : -8.020 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper




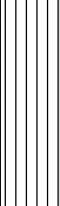

DATE STARTED : 16/12/13

DATE COMPLETED : 7/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
					8.0		ML	SANDY SILT: Dark grey, low plasticity. Sand is fine grained sand. <i>(continued)</i>	W	F to St		
					8.50m			SILTY SAND: Grey, fine to medium grained sand. sub-angular quartz.	W	L		
				9.00m U63	9.0		SM		W	L		
				9.35m ES 9.45m								
					10.0		CH	SILTY CLAY: Dark-grey to black, high plasticity. with some fine grained, sub-angular quartz sand.	M	F	10.35: ES	
				10.50m SPT 2, 3, 3 N=6								
				10.95m	11.0							
					11.50m			SANDY CLAY: Dark grey, medium plasticity. Fine grained, silica sand.			12.40: Hand vane (Su) = 52 kPa	
				12.00m U63	12.0		CI		M	F to St		
				12.40m 12.45m ES								
					13.0							
				13.50m U63							13.90: Hand vane (Su) = 58 kPa	
				13.90m 13.95m ES	14.0							
					14.50m			SILTY SAND: Grey, fine grained sand. trace shell material <3mm diameter.				
				15.00m U63	15.0		SM		M	VD		
				15.40m 15.45m ES								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

HOLE NO : S11

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 345862.700, N: 5760917.700 (55 MGA94)

SURFACE ELEVATION : -8.020 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 16/12/13

DATE COMPLETED : 7/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

[illegible]

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S11

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345862.700, N: 5760917.700 (55 MGA94)

SURFACE ELEVATION : -8.020 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper



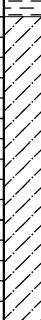


DATE STARTED : 16/12/13

DATE COMPLETED : 7/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 12, 24, 34 N=58	24.0		SM	SANDY SILT /SILTY SAND: Grey, low plasticity. Fine grained sand. trace shell material <3mm diameter.	M	VD / H	24.35: ES
			24.45m								
			25.50m								
			SPT 13, 24, 31 N=55								
			25.95m		26.0		ML	SANDY SILT: Grey, low plasticity. sand is fine grained, with trace shells and carbonate nodules <2mm diameter.	M	H	25.85: ES
			26.50m								
			27.00m								
			SPT 6, 12, 24 N=36								
			27.45m		28.0		SM	SILTY SAND: Grey, fine grained sand. with trace shells and carbonate nodules <3mm diameter, with some layers of weakly to moderately, cemented material.	M	D	27.35: ES
			28.50m								
			SPT 14, 19, 22 N=41								
			28.95m								
					29.0		SC	SAND: Grey, fine to coarse grained sand. trace shells <2mm diameter, fines are medium plasticity.	M	D	
			29.50m								
			30.00m								
			SPT 5, 7, 22 N=29								
			30.45m		31.0						
			31.50m								
			U63								
			31.95m								

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S11

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345862.700, N: 5760917.700 (55 MGA94)

SURFACE ELEVATION : -8.020 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 16/12/13

DATE COMPLETED : 7/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL								
PROGRESS			PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER												
						32.0			SAND: Grey, fine to coarse grained sand. trace shells <2mm diameter, fines are medium plasticity. <i>(continued)</i>			D	31.95: HP In-situ >=600 kPa; (Pocket penetrometer (qa)). Hand vane: penetration refusal
					33.00m SPT 6, 16, 29 N=45	33.0							
					33.45m								
						34.0							
					34.50m U63								
					34.95m	35.0							
						35.50m			SANDY CLAY /SANDY SILT: Grey, fine, high plasticity. trace shells and carbonate nodules to 7mm.	M		Vst	
					36.00m SPT 5, 14, 31 N=45	36.0							
					36.45m								
						37.0							
					37.50m SPT 7, 12, 22 N=34								
					37.95m	38.0							
					39.00m SPT 5, 9, 15 N=24	39.0						St	
					39.45m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S11

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345862.700, N: 5760917.700 (55 MGA94)

SURFACE ELEVATION : -8.020 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 16/12/13

DATE COMPLETED : 7/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
						40.0			SANDY CLAY /SANDY SILT: Grey, fine, high plasticity. trace shells and carbonate nodules to 7mm. (continued)	M	St	40.95: No sample retained in SPT	
					40.50m SPT 4, 11, 16 N=27								
					40.95m								
						41.0							
											</		

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S11 Page 6 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S11

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345862.700, N: 5760917.700 (55 MGA94)

SURFACE ELEVATION : -8.020 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

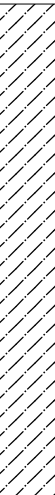
DATE STARTED : 16/12/13

DATE COMPLETED : 7/1/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
PQT ↓				SPT 15, 16/80mm N=R 48.23m	48.0		SM	SILTY SAND: Grey, fine to coarse grained sand, with some zones of moderately cemented dark brown silty sand, with a trace of shell material to 2mm diameter. (continued)	M	VD	48.00: Hammer bouncing	
					50.00m SPT 13, 24, 23 N=47							50.0
				50.45m	50.45m			BOREHOLE S11 TERMINATED AT 50.45 m			50.45: Borehole backfilled with cement grout	
					51.0							
					52.0							
					53.0							
					54.0							
					55.0							
					56.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S12

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345209.250, N: 5760886.710 (55 MGA94)

SURFACE ELEVATION : -1.800 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 18/2/14

DATE COMPLETED : 20/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>PWT</div>				SPT 0, 0, 0 N=0	0.0			CLAY: Dark grey to black, high plasticity. with some fine grained silica sand and shell fragments, up to 10mm with organics (sea grass).			0.00: SPT penetrated under self weight
				0.45m D							
				1.30m ES							1.30: ES pH = 7.7
				1.50m P		CH				VS	
				1.90m 2.00m P							1.90: HP In-situ =12 kPa; Hand vane (Su) = 12 kPa
				2.40m 2.50m P			from approximately 2.5m, with abundant shells up to 30mm diameter				2.40: End of tube too shelly and disturbed to test with hand vane; Hand vane (Su) = 14 kPa
				2.90m 3.00m P							
				3.40m 3.50m P			3.50m			VL	3.40: End of tube too shelly to test with hand vane
				3.90m 4.00m P		SC	4.10m	CLAYEY SAND: Dark grey to black, fine to coarse grained sand. with shells up to 5mm, fines are medium plasticity.			3.90: End of tube too shelly to test with hand vane
				4.40m 4.50m U63				CLAYEY SAND: Pale grey mottled pale brown-yellow, fine to coarse grained sand.			4.40: Hand vane (Su) = 140 kPa
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>HWT</div>				5.00m	5.0						5.00: Hand vane (Su) = 128 kPa
							SC	with fine sub-angular iron nodules, red brown		MD	
				6.00m U63							
				6.50m							6.50: Too stiff to insert hand vane
				7.50m U63		CI	7.00m	CLAY: Pale grey mottled pale brown-yellow, medium plasticity. with fine to medium silica sand.		H	
			8.00m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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FINAL Rev 0

File: 301010-01290 S12 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S12

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345209.250, N: 5760886.710 (55 MGA94)

SURFACE ELEVATION : -1.800 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde




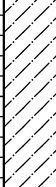
DATE STARTED : 18/2/14

DATE COMPLETED : 20/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0		CI	CLAY: Pale grey mottled pale brown-yellow, medium plasticity. with fine to medium silica sand. <i>(continued)</i>		H	8.00: Hand vane (Su) > 240 kPa
					8.50m						
				9.00m U63	9.0		SC	CLAYEY SAND: Orange-brown and pale grey, fine to coarse grained sand. fines are medium plasticity.		D	9.50: Hand vane (Su) = 220 kPa
				9.50m							
					10.0						
				10.50m U63							
				11.00m	11.0						11.00: Hand vane (Su) = 204 kPa
				12.00m U63	12.0		CH	CLAY: Orange brown, high plasticity. trace fine grained silica sand.	M		12.50: Hand vane (Su) = 220 kPa
				12.50m							
					13.0					H	
				13.50m U63							
				13.80m SPT 22/100mm N=R 13.90m	14.0			layer of cemented clayey sand			13.80: U63 tube refused on hard stratum SPT: hammer bouncing
				15.00m SPT 5, 11, 15 N=26	15.0		SM	SILTY SAND: Orange-brown, fine to coarse grained sand, sub-rounded. with trace fine shell fragments and rare sub-rounded, pale grey, igneous gravel.		MD	15.30: Fs
				15.45m				10mm band of clayey sand			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S12 Page 2 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S12

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345209.250, N: 5760886.710 (55 MGA94)

SURFACE ELEVATION : -1.800 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 18/2/14

DATE COMPLETED : 20/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					16.0			SILTY SAND: Orange-brown, fine to coarse grained sand, sub-rounded, with trace fine shell fragments and rare sub-rounded, pale grey, igneous gravel. <i>(continued)</i>			
				16.50m SPT 9, 15, 21 N=36							
				16.95m							
					17.0						
						SM					
				18.00m SPT 8, 14, 23 N=37	18.0			SILTY SAND: Brown-olive, fine to medium grained sand, sub-rounded, with shell fragments up to 10mm diameter.	M	D	
				18.45m							
					19.0	19.00m					
				19.50m SPT 12, 15, 20 N=35							
				19.95m							
					20.0		SM	shell-rich horizon, 20mm thick			
				21.00m SPT 13, 18, 24 N=42	21.0						
				21.45m							
					22.0	22.00m					
				22.50m SPT 6, 13, 18 N=31							
				22.95m	23.0		SM	SILTY SAND: Grey, fine grained sand, sub-rounded. trace fine grained carbonate shell fragments.			
				24.00m	24.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S12

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 5 OF 7

POSITION : E: 345209.250, N: 5760886.710 (55 MGA94) SURFACE ELEVATION : -1.800 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : D Van Liefde
DATE STARTED : 18/2/14 DATE COMPLETED : 20/2/14 DATE LOGGED : LOGGED BY : J. Hixson CHECKED BY : C Pilkington

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					32.0		SM	SILTY SAND: Grey, fine grained sand, sub-rounded. trace fine grained carbonate shell fragments. <i>(continued)</i>		D	
								32.50m			
				33.00m SPT 2, 4, 15 N=19	33.0			SANDY SILT: Dark grey to green, high plasticity. Fine grained, sub-rounded, with trace carbonate fragments sand.			
				33.45m							
					34.0						
				34.50m SPT 5, 7, 15 N=22							
				34.95m	35.0						
				36.00m SPT 2, 3, 8 N=11	36.0		MH		M		36.00: suspected higher moisture content in silty sand sample
				36.45m							
					37.0						
				37.50m SPT 1, 3, 15 N=18							
				37.95m	38.0						
				39.00m SPT 11, 16, 20 N=36	39.0					H	
				39.45m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

HOLE NO : S12

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

PROJECT : FWH - Main
LOCATION : North Arm

POSITION : E: 345209.250, N: 5760886.710 (55 MGA94)

SURFACE ELEVATION : -1.800 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 18/2/14

DATE COMPLETED : 20/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING							MATERIAL					
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
<div>HWT</div> <div>SANDY SILT: Grey-green, low plasticity. Fine grained, silica sand. trace fine grained carbonate shell.</div> <div>M</div> <div>Vst - H</div> <div>from 46.0m, with some clay</div>												

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S12

FILE / JOB NO : 301010-01290

SHEET : 7 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 345209.250, N: 5760886.710 (55 MGA94)

SURFACE ELEVATION : -1.800 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : D Van Liefde

DATE STARTED : 18/2/14

DATE COMPLETED : 20/2/14

DATE LOGGED :

LOGGED BY : J. Hixson

CHECKED BY : C Pilkington

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S13

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345637.410, N: 5759888.900 (55 MGA94)

SURFACE ELEVATION : -8.720 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper


DATE STARTED : 28/2/14

DATE COMPLETED : 4/3/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>PWT</div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div>HWT</div>				SPT 4, 3, 5 N=8	0.0		SP	SILICEOUS CARBONATE SAND: Brown, fine to coarse grained sand, sub-rounded to angular, with some silt, with some shells up to 30mm in size. At the surface with some ferricrete gravel and cobbles up to 100mm in size, plant material and biological material.	W	L	0.00: ES & G (from grab) pH = 7.99 SPT no sample recovery, clayey sand smeared on outside of SPT	
				0.45m				0.30m	CLAYEY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-rounded to sub-angular.			
				1.00m	SPT 4, 6, 11 N=17	1.0			1.20m			1.00: ES (from combined SPT samples) pH = 7.8
				1.45m	SPT 10, 18, 21 N=39				SILTY SILICEOUS SAND: Pale grey, fine to medium grained sand, sub-rounded to sub-angular.			
				1.90m								
				3.00m	SPT 3, 4, 5 N=9	3.0						3.00: ES pH = 7.58
				3.45m								
				4.50m	SPT 4, 5, 6 N=11	4.0			from 4.0m: with some clay	M	MD	
				4.95m								
				6.00m	SPT 4, 5, 6 N=11	6.0			5.50m			
				6.45m	U63				CLAYEY SAND: Pale grey, red and pale brown mottled, fine to medium grained sand.			6.50: ES pH = 7.12
				6.90m								
			7.50m	SPT 5, 9, 10 N=19	7.0			from 7.2m: pale grey-green				
			7.95m									

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 S13 Page 1 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S13

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345637.410, N: 5759888.900 (55 MGA94)

SURFACE ELEVATION : -8.720 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 28/2/14

DATE COMPLETED : 4/3/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL			
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY
					8.0		SC	CLAYEY SAND: Pale grey, red and pale brown mottled, fine to medium grained sand. (continued)	
					8.50m				
					9.00m		SC	CLAYEY SILICEOUS CARBONATE SAND: Brown, fine to coarse grained sand, sub-rounded to sub-angular.	
				SPT 5, 6, 7 N=13	9.0				
					9.45m				
					10.0				
					10.50m			SANDY CLAY: Brown, medium plasticity. Fine grained silica sand. trace white carbonate nodules up to 3mm in size.	
				SPT 2, 5, 7 N=12	10.50m				
					10.95m				
				U63	11.00m				
					11.40m		CI		
					12.00m				
				SPT 4, 9, 12 N=21	12.0				
					12.45m				
					13.0				
					13.50m			SILTY SAND: Brown, fine grained sand. with some shells up to 10mm in size.	
				SPT 5, 10, 15 N=25	13.50m				
					13.95m				
					14.0				
					15.0		SM	from 14.5m to 16.0m: fine to medium grained sand	
				SPT 7, 9, 16 N=25	15.00m				
					15.45m				
					16.0				

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 S13 Page 2 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S13

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345637.410, N: 5759888.900 (55 MGA94)

SURFACE ELEVATION : -8.720 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 28/2/14

DATE COMPLETED : 4/3/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					16.0			SILTY SAND: Brown, fine grained sand. with some shells up to 10mm in size. <i>(continued)</i> from 16.0m: dark brown			
				16.50m SPT 25/120mm N=R 16.62m	17.0		SM			VD	16.50: Hammer bouncing
				18.00m SPT 10, 14, 12 N=26 18.45m	18.0					MD	
					19.0			19.00m SILTY SAND: Grey, fine grained sand. with trace carbonate nodules up to 2mm in size.			
				19.50m SPT 7, 14, 20 N=34 19.95m	20.0				M		
				21.00m SPT 13, 11, 19 N=30 21.45m	21.0		SM			D	
				22.50m SPT 8, 18, 25 N=43 22.95m	23.0						
				24.00m	24.0			24.00m			

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S13

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345637.410, N: 5759888.900 (55 MGA94)

SURFACE ELEVATION : -8.720 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 28/2/14

DATE COMPLETED : 4/3/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING						MATERIAL					
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 8, 13, 19 N=32	24.0			SANDY SILT: Grey, low plasticity. Fine grained silica sand. with trace carbonate nodules up to 2mm in size.		D	
				24.45m			ML				
								25.00m			
								SANDY SILT: Grey, low plasticity. Fine grained sand. with trace carbonate nodules up to 3mm in size.			
				25.50m SPT 4, 9, 17 N=26	25.0					VSt	
				25.95m							
							ML				
				27.00m SPT 4, 20, 18 N=38	27.0					H	
				27.45m							
								28.00m	M		
								SILTY SAND: Grey, fine grained sand. with trace carbonate nodules up to 2mm in size.			
				28.50m SPT 5, 9, 13 N=22	28.0						
				28.95m							
				30.00m SPT 5, 10, 17 N=27	30.0		SM			MD	
				30.45m							
				31.50m SPT 6, 10, 9 N=19	31.0						
				31.95m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S13

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345637.410, N: 5759888.900 (55 MGA94)

SURFACE ELEVATION : -8.720 (CD)

ANGLE FROM HORIZONTAL : 90°

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CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 28/2/14

DATE COMPLETED : 4/3/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					32.0			SILTY SAND: Grey, fine grained sand. with trace carbonate nodules up to 2mm in size. <i>(continued)</i>			
				33.00m SPT 4, 7, 14 N=21	33.0		SM			MD	
				33.45m							
					34.0			SANDY SILT: Grey, low plasticity. Fine grained sand.			
				34.50m SPT 1, 2, 10 N=12			ML				
				34.95m	35.0					Vst	
								SANDY CLAY: Grey, high plasticity. Fine grained silica sand.			
				36.00m U63	36.0				M		
				36.40m							36.40: Hand vane (Su) = 192kPa
					37.0						
				37.50m U63							
				37.90m	38.0		CH				37.90: Hand vane (Su) > 240kPa
					39.0					H	
				39.00m U63							
				39.40m							39.40: Hand vane (Su) > 240kPa
					40.00m						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S13

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345637.410, N: 5759888.900 (55 MGA94)

SURFACE ELEVATION : -8.720 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : T Harper

DATE STARTED : 28/2/14

DATE COMPLETED : 4/3/14

DATE LOGGED :

LOGGED BY : C. Pilkington

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					40.0			SILTY CARBONATE SAND: Green, fine to medium grained sand, sub-rounded to sub-angular. with some shells up to 10mm in size.			40.50: U63 tube refusal after 300mm
				40.50m U63							
				40.80m							
					41.0					D	
				42.00m SPT 6, 11, 27 N=38	42.0						
				42.45m							
					43.0		SM	from 43.0m: pale green, fine to coarse grained sand			
				43.50m SPT 9, 10, 13 N=23						MD	
				43.95m							
					44.0						
								from 44.5m: pale brown			
				45.00m SPT 10, 10, 30 N=40	45.0					D	
				45.45m							
					46.0			46.00m			
								SANDY SILT: Pale grey, low plasticity. Fine grained, moderately weakly cemented sand.			
				46.50m SPT 20/90mm N=R 46.59m			ML				46.50: Hammer bouncing
					47.0					H	
								47.50m			
								CLAYEY SILT: Pale grey and white mottled, low plasticity. with some 5-50mm thick layers of moderately cemented material.			
							ML				
				48.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S13 Page 6 OF 7


NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S13

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 7 OF 7

POSITION : E: 345637.410, N: 5759888.900 (55 MGA94) SURFACE ELEVATION : -8.720 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : T Harper
DATE STARTED : 28/2/14 DATE COMPLETED : 4/3/14 DATE LOGGED : LOGGED BY : C. Pilkington CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>HWT</div><div></div></div>	<div><div></div><div></div></div>			SPT 21/110mm N=R 48.11m	48.0		ML	CLAYEY SILT: Pale grey and white mottled, low plasticity, with some 5-50mm thick layers of moderately cemented material. <i>(continued)</i>	M	H	48.00: Hammer bouncing		
					50.00m SPT 10, 29, 21/80mm N=R 50.38m							50.0	50.38m
								BOREHOLE S13 TERMINATED AT 50.38 m					
					51.0								
					52.0								
					53.0								
					54.0								
					55.0								
					56.0								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S14r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 6

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345093.730, N: 5759323.370 (55 MGA94)

SURFACE ELEVATION : -10.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 9/5/14

DATE COMPLETED : 12/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S14r Page 1 OF 6

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S14r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 6

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345093.730, N: 5759323.370 (55 MGA94)

SURFACE ELEVATION : -10.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 9/5/14

DATE COMPLETED : 12/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
					8.0		ML	SANDY SILT: Grey, low plasticity. Fine grained, silica sand. trace shell fragments. <i>(continued)</i>				penetrometer) Hand vane refusal
								8.50m				
				9.00m SPT 6, 11, 15 N=26	9.0			SILT: Grey, low plasticity. with some clay, with fine grained, silica sand, trace shell fragments. Some weakly to moderately cemented silt beds.				
				9.45m				100mm thick cemented silt bed (inferred)				9.50: From 9.5-10.5m drilling was slower
					10.0							
				10.50m SPT 15/30mm N=R 10.53m			ML	200mm thick light grey cemented silt bed, consistency of low strength siltstone (appears to be calcareous cementation)	M			10.50: SPT hammer double bouncing 10.60: From 10.6-12.0m: easy drilling
					11.0							
				12.00m SPT 35, 30/50mm N=R 12.20m	12.0			300mm thick light grey cemented silt bed, consistency of high strength siltstone		H		12.00: SPT cone damaged, 10% recovery From 12.0-12.3: slow drilling 12.30: From 12.3-12.8m: slow drilling
								12.80m				12.80: From 12.8-13.5m: slow drilling
					13.0		ML	SILT (CEMENTED): Grey, low plasticity. Weakly cemented (inferred from drilling observations).		D		
				13.50m SPT 5, 9, 20 N=29				13.50m				13.50: From 13.5m: rapid drilling
				13.95m								
					14.0							
							ML			M		
				15.00m U63	15.0							15.00: Utube refusal after 300mm HP In-situ = 600+kPa (pocket penetrometer) at base of tube
				15.30m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S14r

FILE / JOB NO : 301010-01290

SHEET : 3 OF 6

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345093.730, N: 5759323.370 (55 MGA94)

SURFACE ELEVATION : -10.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 9/5/14

DATE COMPLETED : 12/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER							Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components			
					16.0			SILT: Grey, low plasticity. with some fine grained, silica sand, with some clay, trace 10mm thick weakly cemented beds. <i>(continued)</i>			
				16.50m SPT 4, 6, 9 N=15							
				16.95m				10mm thick weakly cemented bed, consistency of extremely low strength siltstone			
					17.0						
				18.00m SPT 1, 5, 9 N=14	18.0		ML			H	
				18.45m							
					19.0			From 19.0m: with some hard clayey silt beds			
				19.50m U63							19.50: Utube refusal after 300mm
				19.80m							
					20.0				M		
					20.50m						
				21.00m SPT 1, 5, 9 N=14	21.0		SM	Interbedded SILTY SAND (SM), CLAYEY SILT (ML), and SILTY CLAY (CI): Medium dense silty sand beds, fine to medium frained, sub-angular to sub-rounded silty sand, low plasticity clayey silt, hard silty clay, medium plasticity, hard, grey trace shell fragments.		H / MD	
				21.45m							
					22.0						
					22.00m						
				22.50m U63				CLAYEY SILT: Grey, low plasticity. trace fine grained, silica sand, trace shell fragments, trace silt, with some clay beds.			
				22.90m							
					23.0		ML			H	22.90: HP In-situ = 420 - 500 kPa; (pocket penetrometer) Hand vane refusal
				24.00m	24.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S14r

FILE / JOB NO : 301010-01290

SHEET : 4 OF 6

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345093.730, N: 5759323.370 (55 MGA94)

SURFACE ELEVATION : -10.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 9/5/14

DATE COMPLETED : 12/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
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See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 S14r Page 4 OF 6

CORED DRILL HOLE LOG

HOLE NO : S14r

FILE / JOB NO : 301010-01290

SHEET : 5 OF 6

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345093.730, N: 5759323.370 (55 MGA94)

SURFACE ELEVATION : -10.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 9/5/14

DATE COMPLETED : 12/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

CASING DIAMETER : 114.3 mm

BARREL (Length) : 1.50 m

BIT :

BIT CONDITION :

DRILLING				MATERIAL				FRACTURES									
PROGRESS		CORE LOSS (CORE LOSS RUN %)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50)						NATURAL FRACTURE (mm)		VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
DRILLING & CASING	WATER							EL	VL	L	M	H	VH	EH	20		
				24.0													
				25.0													
				26.0													
				27.0													
				28.0													
				29.0													
				29.13m		START CORING AT 29.13m											
				30.0		SILTSTONE: grey, with occasional fragmented zone joints, typically 45-60degrees, planar, rough, silt veneer in joint	SW									29.13: No bedding evident 29.13-29.19m: Highly Fractured	
				30.50												29.50: Core from 29.5-29.7m JT 45° VR PR RF	
				31.0												30.00: Highly Fractured Core from 30.0-30.5m JT 45° VR PR RF JT 60° VR PR RF JT 60° VR PR RF 30.45: ES JT 45° VR PR RF	
				31.40												JTx2 75° VR PR RF with carbonate cementation JT 45° VR PR RF JT 45° VR PR RF 30.90: 10mm clay (weathered in region of joint)	
				31.80												JT 45° VR PR RF 31.40: Core from 31.4-31.6m	
				32.00												31.80: Core from 31.8-32.0m	

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S14r 5 OF 6

AGS 3.1 RTA 1.1 LIB 06.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS GPJ <<DrawingFile>> 13/09/2014 10:23

FINAL Rev 0

CORED DRILL HOLE LOG

HOLE NO : S14r

FILE / JOB NO : 301010-01290

SHEET : 6 OF 6

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345093.730, N: 5759323.370 (55 MGA94)

SURFACE ELEVATION : -10.700 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : C Studd

DATE STARTED : 9/5/14

DATE COMPLETED : 12/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

CASING DIAMETER : 114.3 mm

BARREL (Length) : 1.50 m

BIT :

BIT CONDITION :

DRILLING				MATERIAL				FRACTURES			
PROGRESS	DRILLING & CASING	WATER	CORE LOSS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	Weathering	ESTIMATED STRENGTH	NATURAL FRACTURE	ADDITIONAL DATA
							ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)		Is(50) ● Axial ○ Diametral	(mm)	(joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
	HQ CORING - CASING		0% LOSS	height, 61.2mm diameter, 32.00m	32.0		SILTSTONE: grey, with occasional fragmented zone joints, typically 45-60degrees, planar, rough, silt veneer in joint (continued)	SW			JT 45° VR PR RF
				Is(50) d=0.8 MPa	33.0						JT 45° VR PR RF
			0% LOSS	Is(50) d=1.91 a=0.79 MPa	34.0						32.90: Core from 32.9-33.0m
					34.50		BOREHOLE S14r TERMINATED AT 34.50 m				JT 75° VR PR RF
											JT 45° VR PR RF
											JT 45° VR PR RF
											JT 45° VR PR RF
											33.70: Core from 33.7-33.9m
											JT 45° VR PR RF
											JT 45° VR PR RF
											34.00: 34.0-34.25m: Highly Fractured
											JT 40° VR PR RF
											34.10: 10mm clay (weathered in region of joint)
											34.50: Borehole backfilled with cement grout

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S14r 6 OF 6



NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S15

FILE / JOB NO : 301010-01290

SHEET : 1 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344585.610, N: 5761480.420 (55 MGA94)

SURFACE ELEVATION : 1.200 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 3/4/14

DATE COMPLETED : 4/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S15

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344585.610, N: 5761480.420 (55 MGA94)

SURFACE ELEVATION : 1.200 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 3/4/14

DATE COMPLETED : 4/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0			SILTY SAND: White grey, with minor yellow-brown and red-brown mottling, fine to medium grained sand. <i>(continued)</i>			
				9.00m P	9.0		SM			MD	
				9.40m							9.40: HP In-situ = 120 - 180 kPa; (pocket penetrometer) Hand vane (Su) = 40kPa Residual shear = 7kPa
					10.0			SANDY CLAY: Dark grey, low plasticity. Sub-rounded silica sand. sand fraction decreasing with depth.			
				10.50m U63			CL				
				10.90m	11.0						10.90: Hand vane (Su) = 90kPa Residual shear = 10kPa
								11.50m			
				12.00m U63	12.0			CLAYEY SILT: Grey, high plasticity. with fine to coarse sand.	M		
				12.40m							12.40: HP In-situ = 220 - 240 kPa; (pocket penetrometer) Hand vane (Su) = 90kPa Residual shear = 16kPa
					13.0		MH	Between 13.0-14.5m: with some beds of cemented silt, consistency of high strength siltstone up to 50mm thick		Vst	
				13.55m SPT 28, 18, 15 N=33							13.50: U tube refusal after 50mm no recovery
				14.00m	14.0						
								14.50m			
				15.00m SPT 1, 2, 19 N=21	15.0		ML	CLAYEY SILT: Grey, low plasticity. trace fine grained silica sand, trace shells, clay fraction decreasing with depth.			
				15.45m							
								16.00m			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Consulting

FINAL Rev 0

File: 301010-01290 S15 Page 2 OF 7

HOLE NO : S15

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation

LOCATION : North Arm

POSITION : E: 344585.610, N: 5761480.420 (55 MGA94)

SURFACE ELEVATION : 1.200 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


DATE STARTED : 3/4/14

DATE COMPLETED : 4/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL						
PROGRESS			PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER	DILLING										
						16.0		ML	SILT: Grey, low plasticity. some clay, trace fine grained silica sand, clay fraction decreasing with depth. 			

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S15

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344585.610, N: 5761480.420 (55 MGA94)

SURFACE ELEVATION : 1.200 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen



DATE STARTED : 3/4/14

DATE COMPLETED : 4/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
				SPT 9, 13, 17 N=30	24.0		SM	SILTY SILICEOUS SAND: Grey, fine to medium grained sand. trace shell fragments. <i>(continued)</i>	W	D	
			24.45m								
			25.50m								
			SPT 8, 14, 20 N=34								
			25.95m		26.0						
								26.50m			
								SILT: Grey, low plasticity. with some fine grained sand.			
				SPT 8, 12, 20 N=32	27.0		ML			H	
			27.45m								
			28.0								
			28.50m								
			SPT 12/100mm N=R 28.60m		28.55m		ML	SILT (CEMENTED): Weakly cemented.			28.50: SPT hammer double bouncing
								28.75m			
								CLAYEY SILT: Grey, low plasticity. trace fine grained silica sand.			
					29.0				M	Vst	
			30.00m								
			SPT 2, 3, 9 N=12								
			30.45m			ML					
					31.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S15

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344585.610, N: 5761480.420 (55 MGA94)

SURFACE ELEVATION : 1.200 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 3/4/14

DATE COMPLETED : 4/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING						MATERIAL			
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY
					32.0		ML	CLAYEY SILT: Grey, low plasticity. trace fine grained silica sand. (continued)	
					32.50m			SILT: Grey, low plasticity. trace fine grained silica sand, with some clay.	
					33.00m				
				U63	33.0				
					33.40m				
					34.0				
					34.50m		ML		
				U63					
					34.90m				
					35.0				
					36.0				
					36.20m				
				SPT 3, 10, 21 N=31					
					36.65m				
					37.0				
					37.50m				
				SPT 5, 7, 10 N=17					
					37.95m				
					38.0				
					39.0		ML		
					39.00m				
				SPT 6, 10, 20 N=30					
					39.45m				
					40.0				

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S15

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 344585.610, N: 5761480.420 (55 MGA94)

SURFACE ELEVATION : 1.200 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 3

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


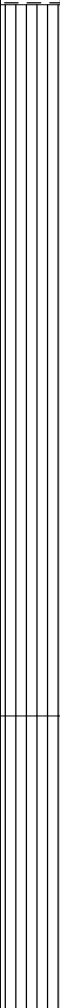
DATE STARTED : 3/4/14

DATE COMPLETED : 4/4/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : C Pilkington

DRILLING							MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
						40.0		ML	SILT: Grey, low plasticity. trace fine grained silica sand, trace shell fragments. <i>(continued)</i>				
				40.50m SPT 5, 5, 11 N=16									
				40.95m									
						41.0							
									41.50m				
								CH	SILTY CLAY: Grey, high plasticity. with fine to medium grained sand. Clay content increasing from 41.5m	M	H	42.40: HP In-situ >600 kPa; (pocket penetrometer)	
				42.00m U63	42.0								
				42.40m									
					43.0								
				43.50m U63									
				43.90m									
					44.0								
				45.00m U63	45.0								
				45.40m									
					46.0				Slightly lower strength, increased silt fraction between 46.0 and 47.5m depth				
				46.50m U63				CH					
				46.90m								46.90: HP In-situ >600 kPa; (pocket penetrometer)	
						47.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S15

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 7 OF 7

POSITION : E: 344585.610, N: 5761480.420 (55 MGA94) SURFACE ELEVATION : 1.200 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 3 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 3/4/14 DATE COMPLETED : 4/4/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : C Pilkington

DRILLING							MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div></div><div>HWT</div><div>▼</div></div>				U63	48.0	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S16r

FILE / JOB NO : 301010-01290

SHEET : 1 OF 5

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345100.290, N: 5759846.370 (55 MGA94)

SURFACE ELEVATION : -10.770 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson


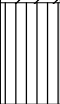

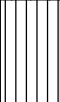

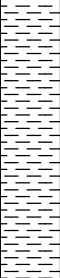

DATE STARTED : 21/6/14

DATE COMPLETED : 27/6/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
PWT	HWT			P	0.0		SM	SILTY SILICEOUS SAND: Brown-grey, fine to medium grained sand. trace shell fragments.	M	VL	0.00: ES & G (taken using grab) pH = 7.68 Piston sample lost		
		0.45m 0.50m D	From 1.0m: with some shell fragments (inferred from drilling observation)	0.50: Windowless sample, sample lost									
				1.50m SPT 7, 4, 4 N=8	1.50m		CH	SANDY CLAY: Dark grey, high plasticity. Fine to coarse grained, sub-rounded to sub-angular, silica sand. trace carbonate shell grit up to 2mm in size.	W	St	1.50: Downhole shear vane attempted, penetration refusal 1.52: ES pH = 7.36		
			1.97m U63	2.00m	SILTY SAND: Grey, fine to medium grained sand.			MD					
				2.40m 2.50m SPT 4, 10, 6 N=16	2.50m		SM	SILTY CLAY: Dark grey, high plasticity. trace fine grained sand, with some lenses of pale brown fine grained silty sand.		F			
			2.95m 3.00m U63	3.0	CH			VS					
				3.40m 3.50m U63	3.50m		CH	CLAYEY SILT: Pale brown, low plasticity. with some fine grained sand.			3.40: Hand vane (Su) = 20kPa Residual shear = 4kPa		
			3.90m 4.01m U63	4.0	ML			St			3.70: ES pH = 7.59; Hand vane (Su) = 68kPa Residual shear = 12kPa 3.90: Hand vane (Su) = 70kPa Residual shear = 10kPa 4.00: Downhole shear vane attempted, penetration refusal		
				4.40m 4.50m U63	4.50m		ML	SANDY SILT: Pale brown, low plasticity. Fine grained sand.			4.40: Hand vane (Su) = 60kPa Residual shear = 16kPa		
			4.90m	5.0	From 4.5m: dark grey			VS			4.90: Hand vane (Su) = 60kPa Residual shear = 10kPa		
				6.00m U63	6.0		ML	From 6.0m: with some weakly cemented bands of fine grained silty sand		VS	6.10: Hand vane (Su) = 120kPa Residual shear = 28kPa		
			6.40m	7.0	6.40: Hand vane refusal								
				7.50m U63	7.50m		ML			St			
			7.90m	8.00m									

See Explanatory Notes for details of abbreviations & basis of descriptions.

WorleyParsons Services Pty Ltd



WorleyParsons
Consulting

FINAL Rev 0

File: 301010-01290 S16r Page 1 OF 5

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S16r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 5

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345100.290, N: 5759846.370 (55 MGA94)

SURFACE ELEVATION : -10.770 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

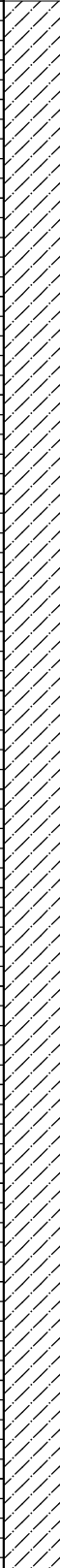
DATE STARTED : 21/6/14

DATE COMPLETED : 27/6/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER											
HWT					8.0		SM	SILTY SAND: Grey, fine grained sand. trace white shell fragments up to 2mm in size.	M	D		
				9.00m SPT 11, 20, 33 N=53	9.0							
				9.45m								VD
					10.0							
				10.50m SPT 10, 24, 34 N=58	10.5							
				10.95m								
					11.0							
					12.0							
				12.00m SPT 7, 13, 24 N=37	12.0							D
				12.45m								
					13.0							
				13.50m SPT 5, 5, 11 N=16	13.5							
				13.95m								MD
					14.0							
					15.0							
				15.00m SPT 6, 8, 13 N=21	15.0							
				15.45m								
					16.0							
					17.0							
					18.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S16r

FILE / JOB NO : 301010-01290

SHEET : 3 OF 5

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345100.290, N: 5759846.370 (55 MGA94)

SURFACE ELEVATION : -10.770 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 21/6/14

DATE COMPLETED : 27/6/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					16.0			SILTY SAND: Grey, fine grained sand. trace white shell fragments up to 2mm in size. <i>(continued)</i>			
				16.50m SPT 7, 7, 7 N=14						MD	
				16.95m							
					17.0						
							SM	From 17.5m: with trace clay	M		
				18.00m SPT 18, 18, 23 N=41	18.0					D	18.00: SPT had 50% recovery
				18.45m							
					19.0			19.00m SANDY SILT: Grey, low plasticity. Fine grained silica sand. trace shell fragments up to 2mm in size, trace silty clay beds up to 20mm thick.			
				19.50m SPT 5, 7, 8 N=15			ML			H	19.50: SPT had 30% recovery
				19.95m							
					20.0						
								20.50m SILTY SILICEOUS CARBONATE SAND INTERBEDDED WITH SANDY SILT (ML): Grey, fine to medium grained sand, sub-rounded. sandy silt is low plasticity, with some clay and sand, trace low plasticity silty clay beds.	W		
				21.00m SPT 5, 14, 30 N=44	21.0		SM			VD / H	
				21.45m							
								21.90m SILTSTONE: grey, fractured (inferred given speed of drilling), some dark grey low strength mudstone beds, moderately weathered			
				22.50m SPT 50/130mm N=R 22.63m					D	H	
					23.0						
				23.50m SPT 35/150mm N=R 23.65m							23.50: SPT hammer double bouncing
								23.65m Continued as Cored Drill Hole			

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S16r Page 3 OF 5

CORED DRILL HOLE LOG

HOLE NO : S16r

FILE / JOB NO : 301010-01290

SHEET : 4 OF 5

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345100.290, N: 5759846.370 (55 MGA94)

SURFACE ELEVATION : -10.770 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : C Nelson

DATE STARTED : 21/6/14

DATE COMPLETED : 27/6/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

CASING DIAMETER :

BARREL (Length) : 1.50 m BIT :

BIT CONDITION :

DRILLING					MATERIAL					FRACTURES				
PROGRESS		CORE LOSS (% RUN %)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50)		NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other		
DRILLING & CASING	WATER							● Axial ○ Diametral						
				16.0				EL -0.03		20				
								VI -0.1		40				
								L -0.3		100				
								M -1		300				
								H -3		1000				
								VH -10						
								EH						
				17.0										
				18.0										
				19.0										
				20.0										
				21.0										
				22.0										
				23.0										

See Explanatory Notes for
details of abbreviations
& basis of descriptions.

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File: 301010-01290 S16r 4 OF 5

AGS 3_1 RTA 1_1 LUB 06.2 GLB Log RTA CORED DRILL HOLE PORT OF HASTINGS BH LOGS.GPJ <<DrawingFile>> 13/09/2014 10:24

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S16r – 23.65m to 29.5m

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S17r

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 1 OF 7

POSITION : E: 345134.400, N: 5760547.570 (55 MGA94) SURFACE ELEVATION : -2.030 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 14/5/14 DATE COMPLETED : 16/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
↑ PWT ↓				P	0.0			SILTY CLAY: Dark grey, high plasticity. trace fine grained sand, trace shell fragments.	M to W	VS	0.00: ES & G (taken from grab) pH = 7.71		
				0.45m 0.50m P				0.45: Hand vane (Su) = 0.5kPa Residual shear = 0kPa 0.50: ES pH - 8.21					
				0.95m 1.00m P				0.95: Hand vane (Su) = 2kPa Residual shear = 0.25kPa					
				1.45m 1.50m P				1.45: Hand vane (Su) = 6kPa Residual shear = 1kPa					
				1.95m 2.00m D		CH		1.95: Hand vane (Su) = 6kPa Residual shear = 1kPa					
				2.45m 2.50m 2.60m P				2.45: Hand vane (Su) = 11kPa Residual shear = 2kPa 2.50: Downhole vane (62mm) Torque = 5.5Nm Residual Torque = 4Nm 2.60: ES pH = 7.76					
				3.00m D			From 3.0m: Clay strength reducing, sand and shell fraction increasing	3.00: Hand vane (Su) = 10kPa Residual shear = 1kPa					
				3.45m 3.50m U63				3.45: Hand vane (Su) = 8kPa Residual shear = 2kPa					
				3.90m 4.00m 4.10m 4.10m U63				3.90: Hand vane (Su) = 10kPa Residual shear = 2kPa 4.00: Downhole vane (62mm) Torque = 13Nm Residual Torque = 2Nm					
				4.50m P			4.50m	SANDY CLAY: Dark grey, high plasticity. with abundant shells and some 100mm thick clay-only beds.					
				4.95m 5.00m P		CH		4.50: HP In-situ = 20kPa (pocket penetrometer) Hand vane (Su) = 10kPa Residual shear = 1kPa	W	D	4.95: Hand vane (Su) = 6kPa Residual shear = 2kPa		
				5.45m 5.50m 5.60m P				5.45: Hand vane (Su) = 5kPa 5.50: Downhole vane (62mm) Torque = 16Nm Residual Torque = 7Nm					
				6.00m P		CH	6.00m	SHELL IN CLAY MATRIX: Dark grey, high plasticity. clay is semi-liquid.			6.00: Hand vane (Su) = 10kPa Residual shear = 3kPa (higher HV reading in clay due to shells)		
				6.40m 6.50m SPT 9, 13, 22 N=35			6.30m	SILTY SILICEOUS SAND: Light brown, fine grained sand.			MD	6.40: Hand vane refusal due to shells	
				6.95m		SM		from 7.2m: silt fraction increasing, becoming brown					
				7.50m SPT 9, 12, 16 N=28									
				7.95m									

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S17r

FILE / JOB NO : 301010-01290

SHEET : 2 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345134.400, N: 5760547.570 (55 MGA94)

SURFACE ELEVATION : -2.030 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 14/5/14

DATE COMPLETED : 16/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					8.0			SILTY SILICEOUS SAND: Light brown, fine grained sand. <i>(continued)</i>			
				9.00m SPT 7, 6, 10 N=16	9.0		SM			MD	
				9.45m							
					10.0						
				10.50m SPT 10, 13, 12 N=25	10.50			CLAYEY SILICEOUS SAND: Dark brown, fine grained sand. Low plasticity clay.			
				10.95m	11.0		SM			MD	
					12.0						
				12.00m SPT 3, 3, 5 N=8	12.0		CI	SILTY CLAY: Dark brown, medium plasticity. with some fine grained sand, appears organic.			11.90: No increase of water pressure when drilling until 11.9m
				12.45m 12.50m U63	12.50			SANDY CLAY: Dark brown, medium plasticity. Medium grained, silica sand. with some carbonate clay beds.			12.50: HP In-situ = 200 - 260 kPa; (pocket penetrometer) Hand vane (Su) = 100kPa
				12.90m	13.0		CI				12.90: HP In-situ = 240 - 400 kPa; (pocket penetrometer) Hand vane (Su) = 130kPa
				13.50m U63	13.50			CLAYEY SILT: Dark grey-brown. silt is non-plastic to low plasticity, trace fine grained sand, with occasional weakly cemented and well cemented silt beds, up to 200mm thick.			
				13.90m	14.0			100mm thick light brown carbonate clay bed			
					15.0		ML	200mm thick well cemented silt bed			14.40: HP In-situ = 70 kPa; (pocket penetrometer) Hand vane (Su) = 30kPa
				15.00m SPT 4, 6, 9 N=15	15.0						
				15.45m 15.50m U63	15.50			CLAYEY SILT: Grey, high plasticity. with fine grained silica and carbonate sand, trace shell fragments, hard with trace firm seams.			15.50: Hand vane (Su) = 240kPa Residual shear = 20kPa
				15.90m	16.0		MH				15.90: HP In-situ = 60 - 90 kPa; (pocket

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S17r

FILE / JOB NO : 301010-01290

SHEET : 3 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345134.400, N: 5760547.570 (55 MGA94)

SURFACE ELEVATION : -2.030 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 14/5/14

DATE COMPLETED : 16/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL						
PROGRESS			DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER											
						16.0		MH	CLAYEY SILT: Grey, high plasticity. with fine grained silica and carbonate sand, trace shell fragments, hard with trace firm seams. <i>(continued)</i>		F	penetrometer) Hand vane (Su) = 40kPa Residual shear = 10kPa
					16.50m U63							16.50: Hand vane refusal
					16.80m				SILTY SILICEOUS SAND: Grey, fine grained sand. trace fine grained, carbonate sand.		MD	16.80: Sand at base of tube
					17.00m SPT 4, 10, 17 N=27	17.0						
					17.45m							
					18.00m SPT 5, 11, 19 N=30	18.0		SM				
					18.45m						D	
						19.0			SANDY SILT: Grey, low plasticity. Fine grained, silica sand. with some weakly cemented beds.			
					19.50m SPT 7, 16, 31 N=47							
					19.95m	20.0		ML		M	H	
						21.0			SILTY SILICEOUS SAND: Grey, fine grained sand. trace shell fragments.			
					21.00m SPT 9, 17, 28 N=45							
					21.45m			SM			D	
						22.0			SANDY SILT: Grey, low plasticity. Fine grained, silica sand. trace clay, with some cemented beds.			
					22.50m SPT 4, 8/150mm, 5/0mm N=R 22.80m			ML	400mm thick well cemented bed		Vst	22.80: SPT hammer double bouncing
						23.0						
									SANDY SILT INTERBEDDED WITH SILTY SAND: Grey, hard sandy silt, dense silty sand, low plasticity, trace fine grained sand, trace weakly cemented silt beds to 27.0m depth.			
						23.50m		ML				
					24.00m	24.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S17r Page 3 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S17r

FILE / JOB NO : 301010-01290

SHEET : 4 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345134.400, N: 5760547.570 (55 MGA94)

SURFACE ELEVATION : -2.030 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen


DATE STARTED : 14/5/14

DATE COMPLETED : 16/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL				
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER									
HWT				SPT 7, 12, 24/120mm N=R	24.0		ML	SANDY SILT INTERBEDDED WITH SILTY SAND: Grey, hard sandy silt, dense silty sand, low plasticity, trace fine grained sand, trace weakly cemented silt beds to 27.0m depth. <i>(continued)</i>	Vst	24.00: SPT hammer bouncing Rock roller attachment used to progress hole from 24.0-27.0m
			24.42m		150mm thick cemented bed					
				25.0						
			25.50m							
			SPT 12, 19, 27 N=46							
			25.95m							
				26.0						
				27.0						
			27.00m							
			SPT 10, 17, 29 N=46							
		27.45m								
			28.0		28.00m		SANDY SILT: Dark grey, low plasticity. Fine grained, silica sand, trace shell fragments, trace weakly cemented beds between 10-200mm thick.	M		
				28.50m						
				SPT 9, 20, 30/140mm N=R						
				28.94m						
					29.0					
					30.0		ML		I	
				30.00m				200mm thick weakly cemented bed		
				SPT 9, 21/140mm N=R						
				30.29m						
					31.0					
					31.50m			10mm thick weakly cemented bed		
				SPT 10, 14, 21 N=35						
				31.95m						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S17r Page 4 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S17r

FILE / JOB NO : 301010-01290

SHEET : 5 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345134.400, N: 5760547.570 (55 MGA94)

SURFACE ELEVATION : -2.030 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 14/5/14

DATE COMPLETED : 16/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					32.0		ML	SANDY SILT: Dark grey, low plasticity. Fine grained, silica sand. trace shell fragments, trace weakly cemented beds between 10-200mm thick. <i>(continued)</i>			
					32.30m			CLAYEY SILT: Grey, low plasticity. trace fine grained sand, trace shell fragments.			
					33.00m U63						
					33.40m						33.40: HP In-situ >600 kPa; (pocket penetrometer)
					34.0						
					34.50m U63						
					34.90m						34.90: HP In-situ >600 kPa; (pocket penetrometer)
					35.0		ML				
					36.00m U63				M	H	
					36.40m						36.40: HP In-situ >600 kPa; (pocket penetrometer)
					37.0						
					37.50m U63						
					37.90m						37.90: HP In-situ >600 kPa; (pocket penetrometer)
					38.0			CLAYEY SILT INTERBEDDED WITH SILTY CLAY: Grey, low plasticity. trace fine grained, silica sand, trace shell fragments.			
					38.00m						
					39.00m U63		CL				
					39.40m						39.40: HP In-situ >600 kPa; (pocket penetrometer)

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S17r Page 5 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S17r

FILE / JOB NO : 301010-01290

SHEET : 6 OF 7

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

POSITION : E: 345134.400, N: 5760547.570 (55 MGA94)

SURFACE ELEVATION : -2.030 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 14/5/14

DATE COMPLETED : 16/5/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
					40.0			CLAYEY SILT INTERBEDDED WITH SILTY CLAY: Grey, low plasticity. trace fine grained, silica sand, trace shell fragments. <i>(continued)</i>			
				40.50m U63			CL				
				40.90m							40.90: HP In-situ >600 kPa; (pocket penetrometer)
					41.0						
								41.40m			
								CLAYEY SILT: Grey, low plasticity. trace fine grained silica and carbonate sand.			
				42.00m U63	42.0						
				42.40m							42.40: HP In-situ >600 kPa; (pocket penetrometer)
					43.0						
				43.50m U63			ML				
				43.90m							43.90: HP In-situ >600 kPa; (pocket penetrometer)
					44.0				M	H	
				45.00m U63	45.0						
				45.40m							45.40: HP In-situ >600 kPa; (pocket penetrometer)
					46.0			SILTY CLAY: Grey, high plasticity. trace fine grained silica and carbonate sand. From 46.0m: clay content increasing slightly			
				46.50m U63							
				46.90m							46.90: HP In-situ >600 kPa; (pocket penetrometer)
					47.0		CH				
				48.00m							

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 S17r Page 6 OF 7

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : S17r

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : North Arm

FILE / JOB NO : 301010-01290
SHEET : 7 OF 7

POSITION : E: 345134.400, N: 5760547.570 (55 MGA94) SURFACE ELEVATION : -2.030 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 14/5/14 DATE COMPLETED : 16/5/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING							MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations		
DRILLING & CASING	WATER												
<div><div>HWT</div><div>▼</div></div>				U63	48.0	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div><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See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : WC3

FILE / JOB NO : 301010-01290

SHEET : 1 OF 2

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Western Channel

POSITION : E: 345619.400, N: 5745693.100 (55 MGA94)

SURFACE ELEVATION : -15.170 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 28/1/14

DATE COMPLETED : 29/1/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

DRILLING						MATERIAL							
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components		MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
↑	PWT			SPT 3, 6, 1 N=7	0.0		SP	0.10m	SAND and GRAVEL and COBBLE: fine to coarse sand and gravel from various materials, including silica, some shell fragments, brown, fine to medium silica sand.	W	L	0.00: ES & G (taken from grab) pH = 6.84	
				0.45m 0.50m D		SM		SILTY SAND / SANDY SILT: fine silica sand, low plasticity silt, grey.					0.50: ES pH = 7.78 0.60: G (0.6-0.8m) HP In-situ = 100-150kPa; (pocket penetrometer) (taken in windowless sample)
↓					1.0		CI		SILTY CLAY: Grey, medium plasticity, some brown medium grained sand beds, with some silt up to 50mm thick, trace fine sand in clay beds.		St	1.50: HP In-situ = 300 - 340 kPa; (pocket penetrometer)	
				1.40m 1.50m U63			becoming high plasticity, thickness of sand beds increasing with depth						
					2.0			2.00m	SILTY SILICEOUS SAND: Brown, fine grained sand, low plasticity, some grey clay beds up to 50mm thick, very stiff intermediate plasticity clay. Clay fraction decreasing with depth, sand fraction increasing with depth.	M		2.00: ES pH = 7.20	
				2.45m 2.50m SPT 4, 3, 10 N=13									
					3.0				becoming brown silty sand, with some grey clayey silt beds up to 50mm thick, some sand to gravel-sized shell fragments, trace mica		MD	3.50: ES & G pH = 7.3	
				3.50m SPT 14, 16, 16 N=32		SM							
					4.0								
				3.95m 4.00m SPT 6, 10, 15 N=25									
					5.0			5.00m	With some grey sandy silt beds up to 50mm thick, silt beds decreasing with depth.			5.50: ES & G pH = 7.18	
				5.50m SPT 8, 43, 7/20mm N=R 5.82m									
					6.0					W	VD		
				6.00m SPT 16, 28, 22/110mm N=R 6.41m		SM							
					7.0								
				7.00m SPT 26, 42, 6/40mm N=R 7.34m									
					8.00m								

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

File: 301010-01290 WC3 Page 1 OF 2


NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : WC3

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Western Channel

FILE / JOB NO : 301010-01290
SHEET : 2 OF 2

POSITION : E: 345619.400, N: 5745693.100 (55 MGA94) SURFACE ELEVATION : -15.170 (CD) ANGLE FROM HORIZONTAL : 90°
RIG TYPE : KL-100 MOUNTING : Barge-Sealift 1 CONTRACTOR : Hagstrom - ABH DRILLER : G Allen
DATE STARTED : 28/1/14 DATE COMPLETED : 29/1/14 DATE LOGGED : LOGGED BY : L. Missen CHECKED BY : J Hixson

DRILLING					MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
DRILLING & CASING	WATER										
DRILLING & CASING HWT ↓				8.50m SPT 11, 20, 30/120mm N=R 8.92m	8.0		SM	SILTY SAND: Grey, fine grained sand. some brown sandy silt beds up to 50mm thick, some sand to fine gravel size shell grafrments, trace mica. becoming grey silty sand, some brown silty sand beds	W	VD	
					9.0			BOREHOLE WC3 TERMINATED AT 8.92 m			8.92: Borehole backfilled with cement grout
					10.0						
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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FINAL Rev 0

CORED DRILL HOLE LOG

HOLE NO : WC4

FILE / JOB NO : 301010-01290

SHEET : 1 OF 1

PROJECT : PoH - Marine Geotechnical Investigation
LOCATION : Western Channel

POSITION : E: 342711.500, N: 5743404.900 (55 MGA94)

SURFACE ELEVATION : -17.400 (CD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : KL-100

MOUNTING : Barge-Sealift 1

CONTRACTOR : Hagstrom - ABH

DRILLER : G Allen

DATE STARTED : 30/1/14

DATE COMPLETED : 31/1/14

DATE LOGGED :

LOGGED BY : L. Missen

CHECKED BY : J Hixson

CASING DIAMETER : 125 mm

BARREL (Length) : 2.60 m

BIT : HQ3 60mm diamond

BIT CONDITION : Good

DRILLING				MATERIAL				FRACTURES			
PROGRESS	DRILLING & CASING	WATER	CORE LOSS (RUN %)	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable) START CORING AT 0.00m	Weathering	ESTIMATED STRENGTH Is(50) ● Axial ○ Diametral	NATURAL FRACTURE (mm)	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
					0.0		BASALT: brown, fine grained, vesicular, very low strength basalt, with some high strength core stones up to 100mm noted, some clay seams with gravel sized, high strength basalt core stones up to 200mm thick noted	HW			0.00: ES pH = 6.93
					0.45m						0.45: No clear joints visible
			0% LOSS		0.80						0.60: ES pH = 6.86
			100% LOSS		1.0						0.80: No core recovery
					1.50						1.50: No core recovery
			100% LOSS		2.00						
				SPT 10, 17, 32 N=49	2.00m		2.00m becoming low strength, fragmented				2.00: double bouncing ES pH = 6.76
				SPT 21, 37, 10/30mm N=R 2.33m	2.33m		2.33m becoming very high strength, highly fractured with fragmented zones, joints mainly sub-vertical and sub-horizontal limonite or clay veneer in joints	HW MW			2.35: Point load JT 45° PR RF JT 80° Clay VR PR RF JT 20° PR RF 2.63: Highly Fractured
			0% LOSS	Is(50) i=0.2 MPa	2.50						
			30% LOSS		2.90						
			50% LOSS		3.0						
					3.28						
			0% LOSS		3.60						
			0% LOSS		4.00		3.80m dark grey, high strength, fragmented	MW			Highly Fractured 3.75: Highly Fractured
			0% LOSS		4.50		4.10m becoming fractured - occasional vesicles				JT 30° Clay VR UN S
					5.0						
			0% LOSS		5.10		5.00m dark brown, fine grained, fractured limonite staining and carbonate veneer in joints, sub-vertical and sub-horizontal joints, joints undulating, rough, occasional vesicles				JT 80° Highly fractured
					5.50						5.50: G
			0% LOSS	Is(50) i=0.6 MPa	5.80m		5.80m becoming very high strength				5.70: ES pH = 7.28 (in distilled water)
					6.0						6.10: Borehole backfilled with cement grout
					6.10		BOREHOLE WC4 TERMINATED AT 6.10 m				
					7.0						
					8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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File: 301010-01290 WC4 1 OF 1



WC4 – 2.5 to 6.1m

Note: fracturing considered to be representative of in-situ state. Highly fractured material required short drill runs to achieve recovery.



**PORT OF HASTINGS DEVELOPMENT AUTHORITY
PORT OF HASTINGS CONTAINER EXPANSION PROJECT - CONTRACT POHDA 2013-001
FACTUAL REPORT ON MARINE GEOTECHNICAL INVESTIGATION**



Appendix 5 - Cone Penetration Testing



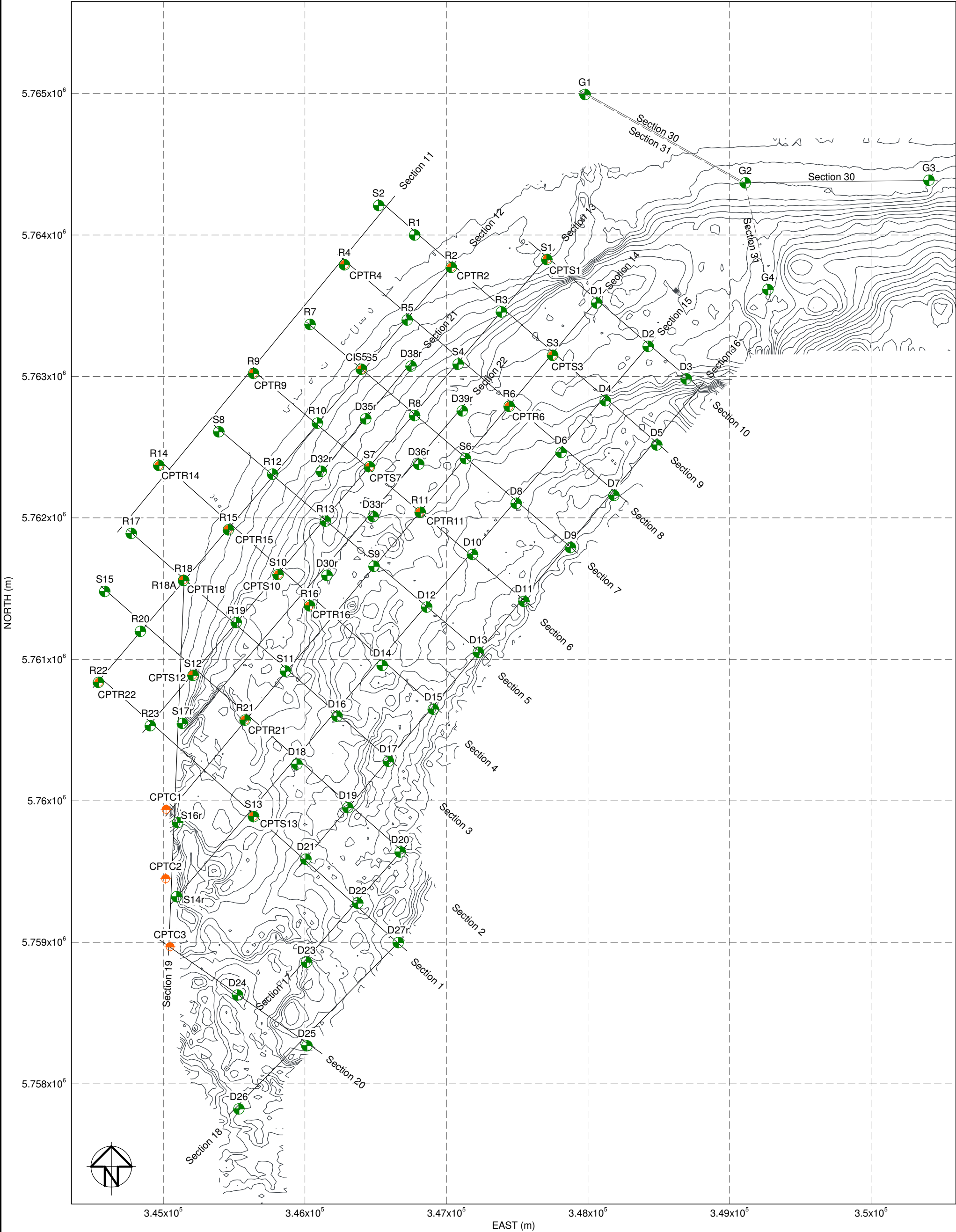
**PORT OF HASTINGS DEVELOPMENT AUTHORITY
PORT OF HASTINGS CONTAINER EXPANSION PROJECT - CONTRACT POHDA 2013-001
FACTUAL REPORT ON MARINE GEOTECHNICAL INVESTIGATION**



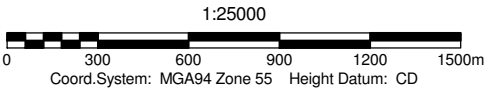
Appendix 6 - Laboratory Testing Results



**PORT OF HASTINGS DEVELOPMENT AUTHORITY
PORT OF HASTINGS CONTAINER EXPANSION PROJECT - CONTRACT POHDA 2013-001
FACTUAL REPORT ON MARINE GEOTECHNICAL INVESTIGATION**



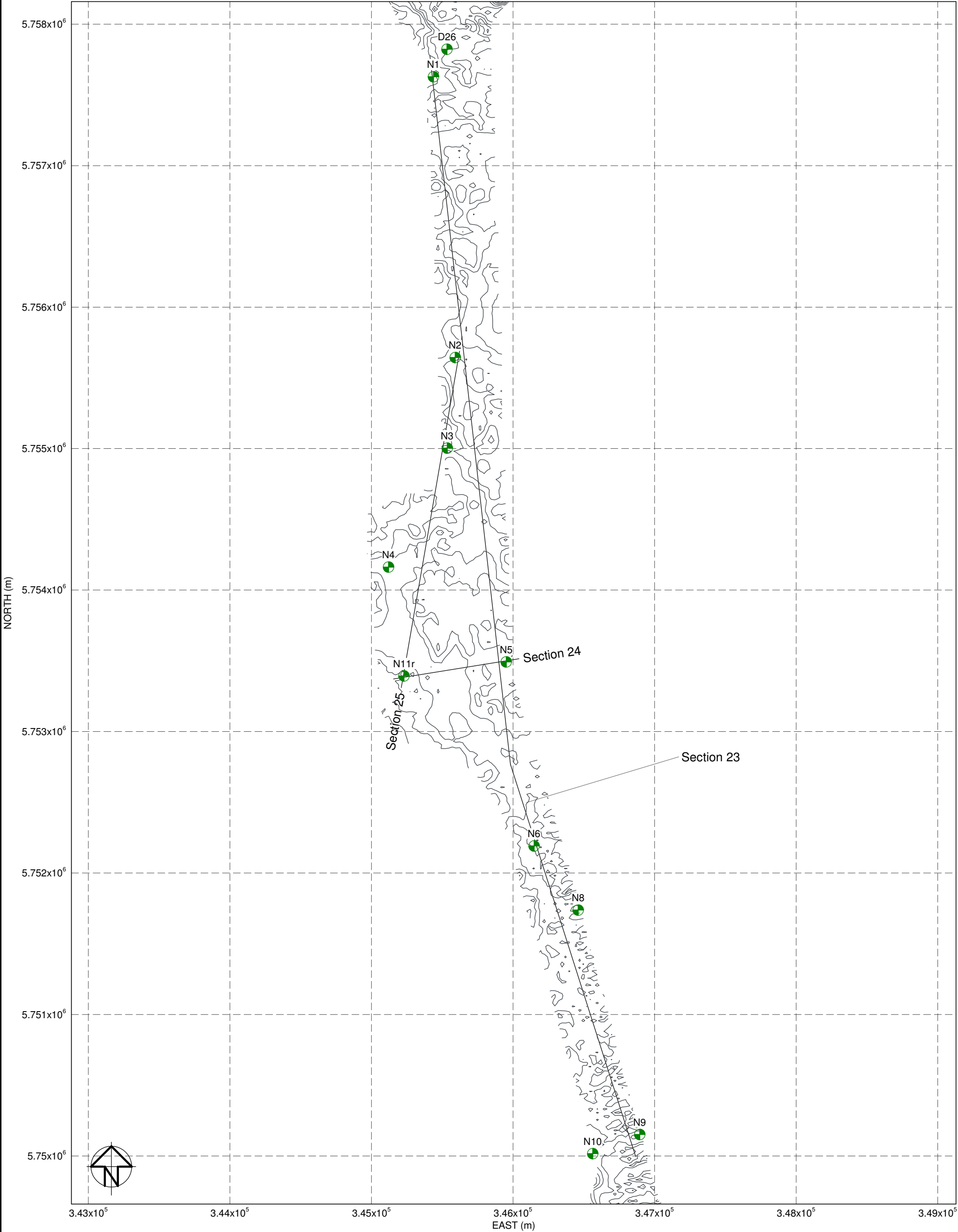
MAP KEY
● Borehole
◆ Cone Penetration Test



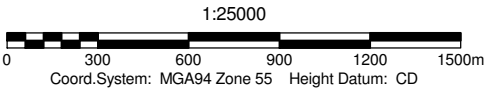
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TITLE
Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
Port Area - Section Line Locations

DRAWN	JDH	DATE	18/08/2014
CHECKED		DATE	18/08/2014
SCALE	1:25000		A3
PROJECT No	301010-01290		FIGURE No Figure 2



MAP KEY
● Borehole



WorleyParsons
Consulting

TITLE

Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
North Arm - Section Line Locations

DRAWN

JDH

DATE

18/08/2014

CHECKED

DATE

18/08/2014

SCALE

1:25000

A3

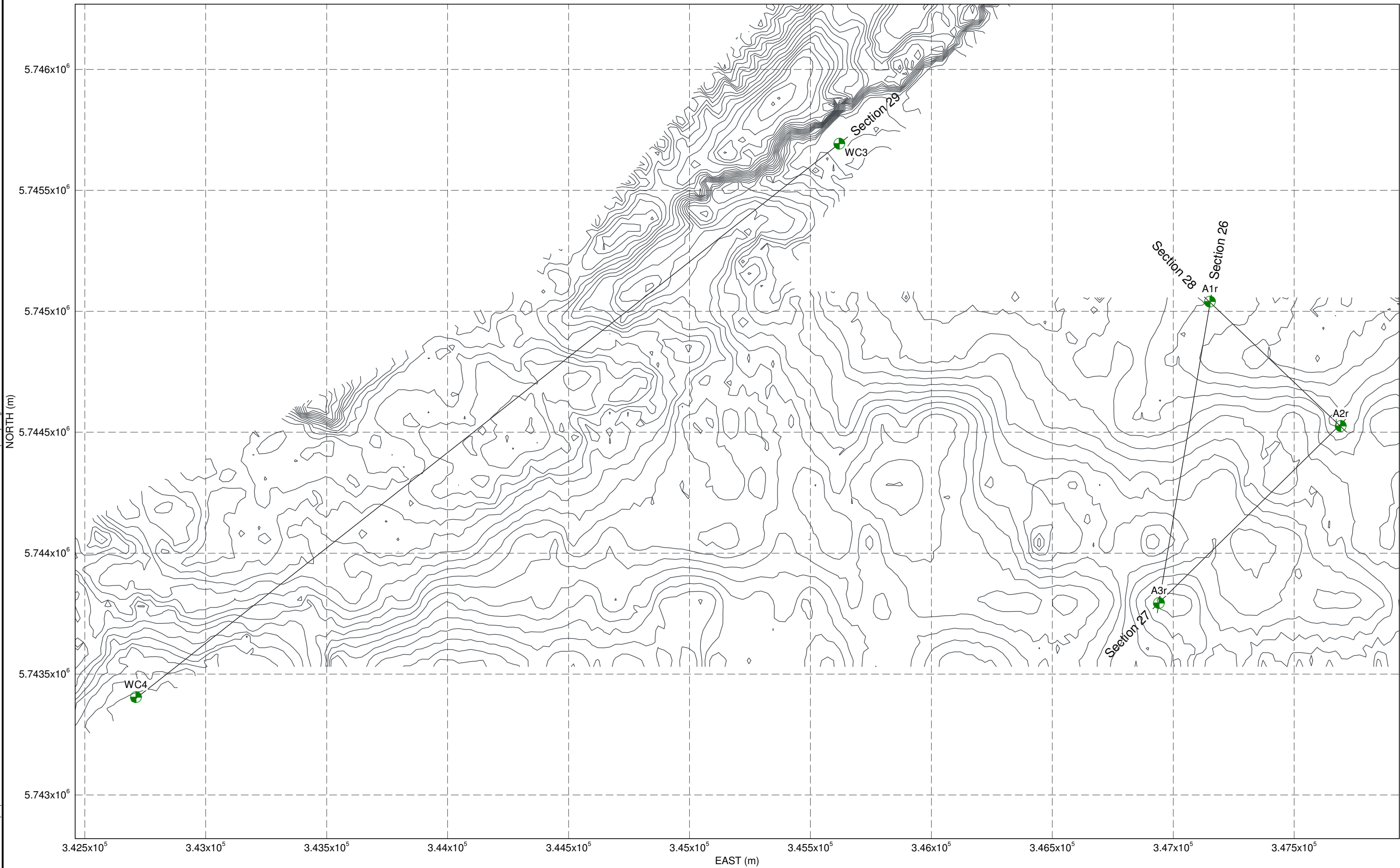
PROJECT No

301010-01290

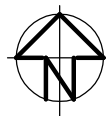
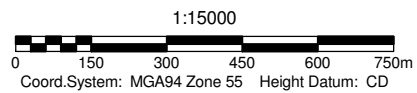
FIGURE No

Figure 3

WP AGS WITH FENCE AND MAP TOOL 1.01 GLB SiteMapReport MAP A3L PORT OF HASTINGS BH LOGS.GPJ ANCHORAGE AND WC PLAN.GDW 18/08/2014 13:27 8.30.004 Developed by Dargal



MAP KEY
● Borehole



WorleyParsons
Consulting

TITLE

Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
Anchorage and Western Channel

DRAWN
JDH

DATE
18/08/2014

CHECKED

DATE
18/08/2014

SCALE

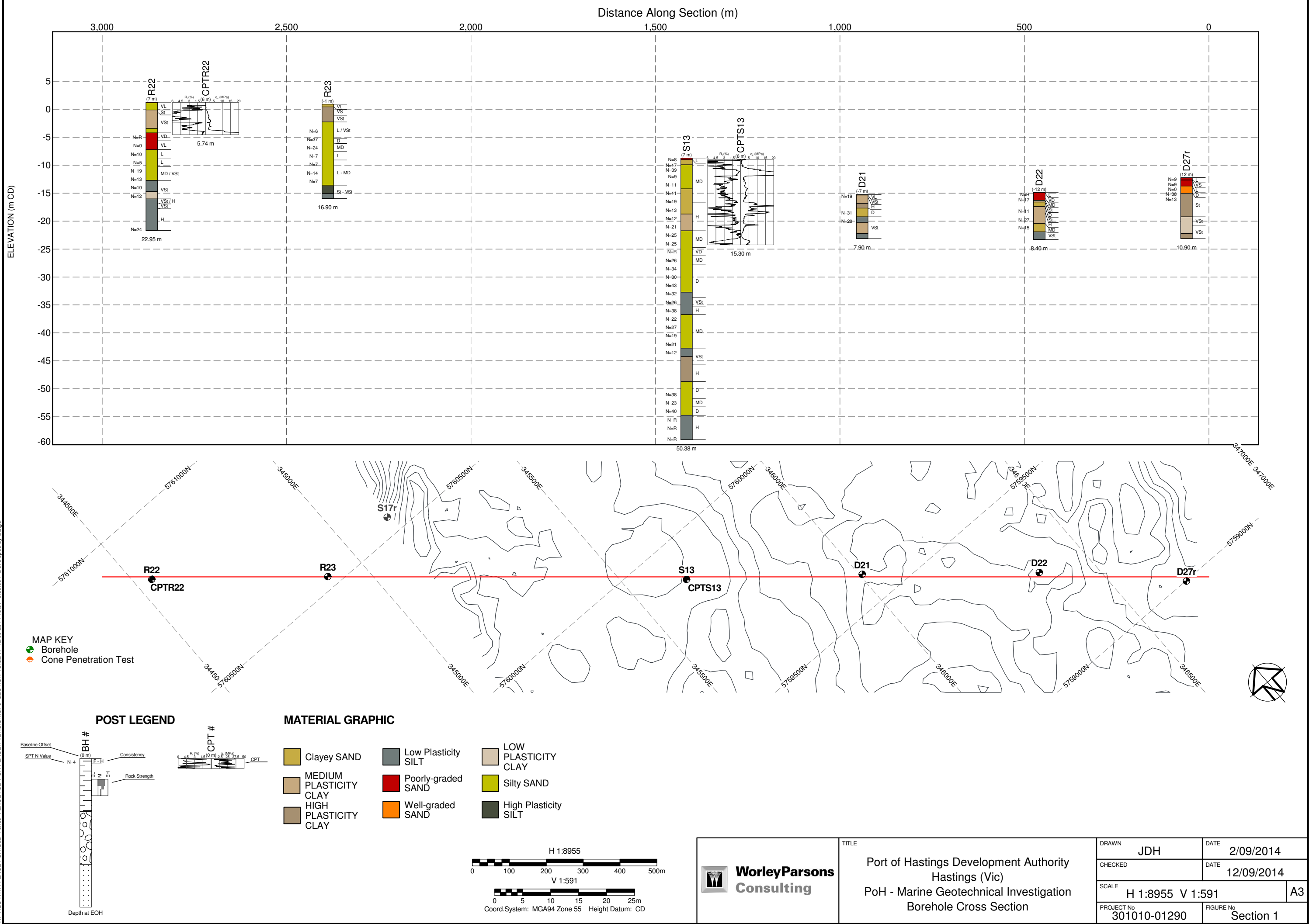
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A3

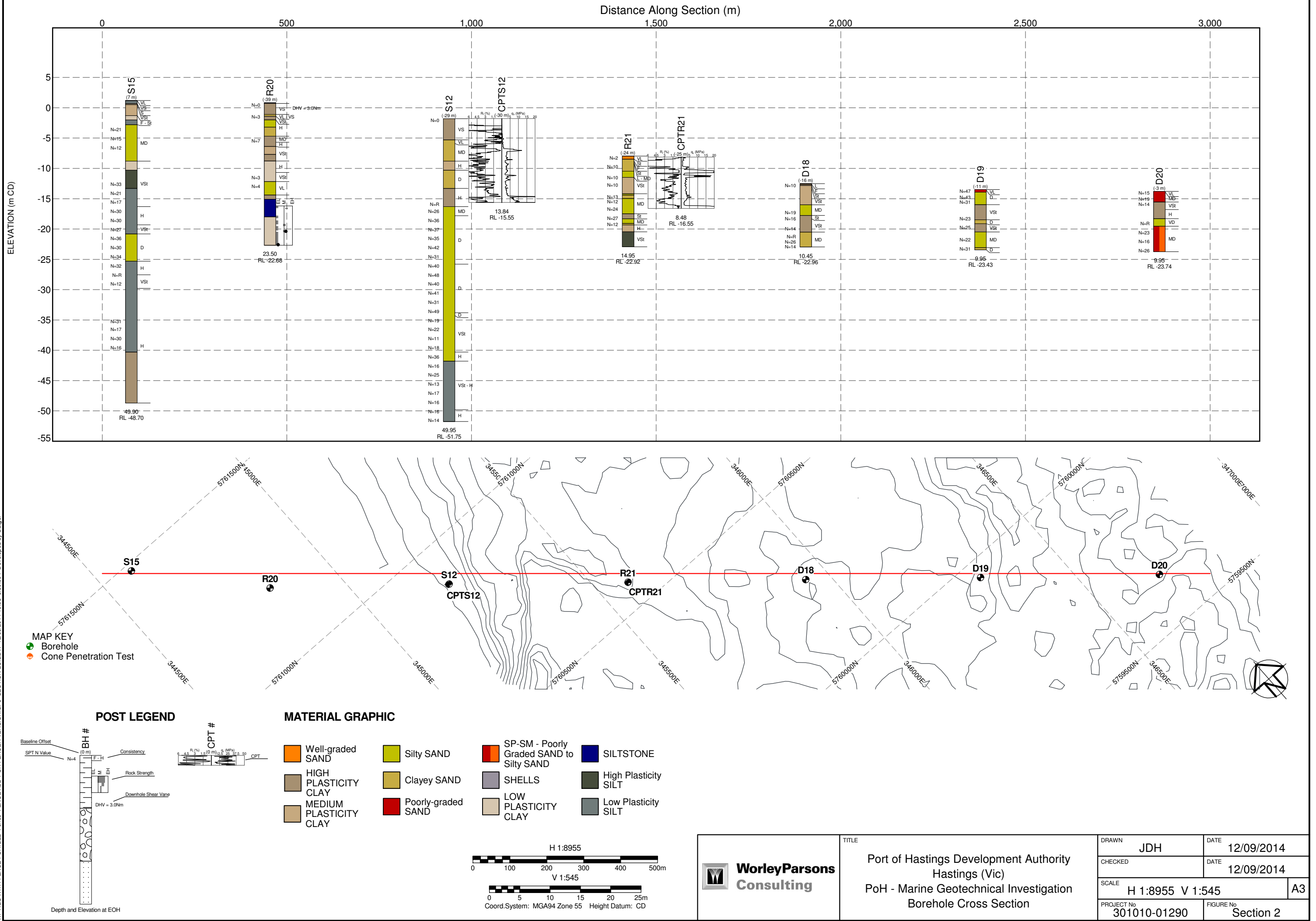
PROJECT No
301010-01290

FIGURE No
Figure 4

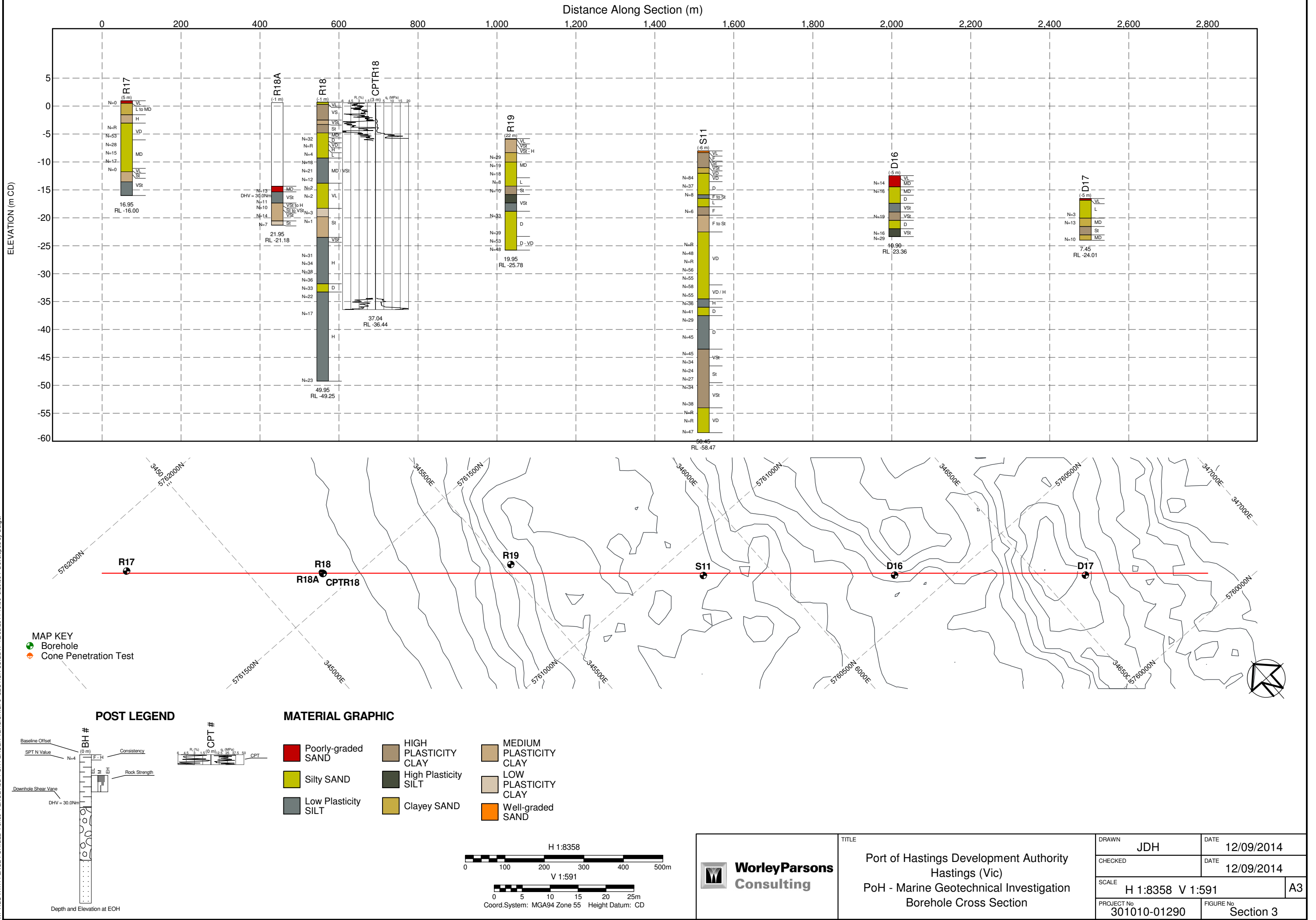
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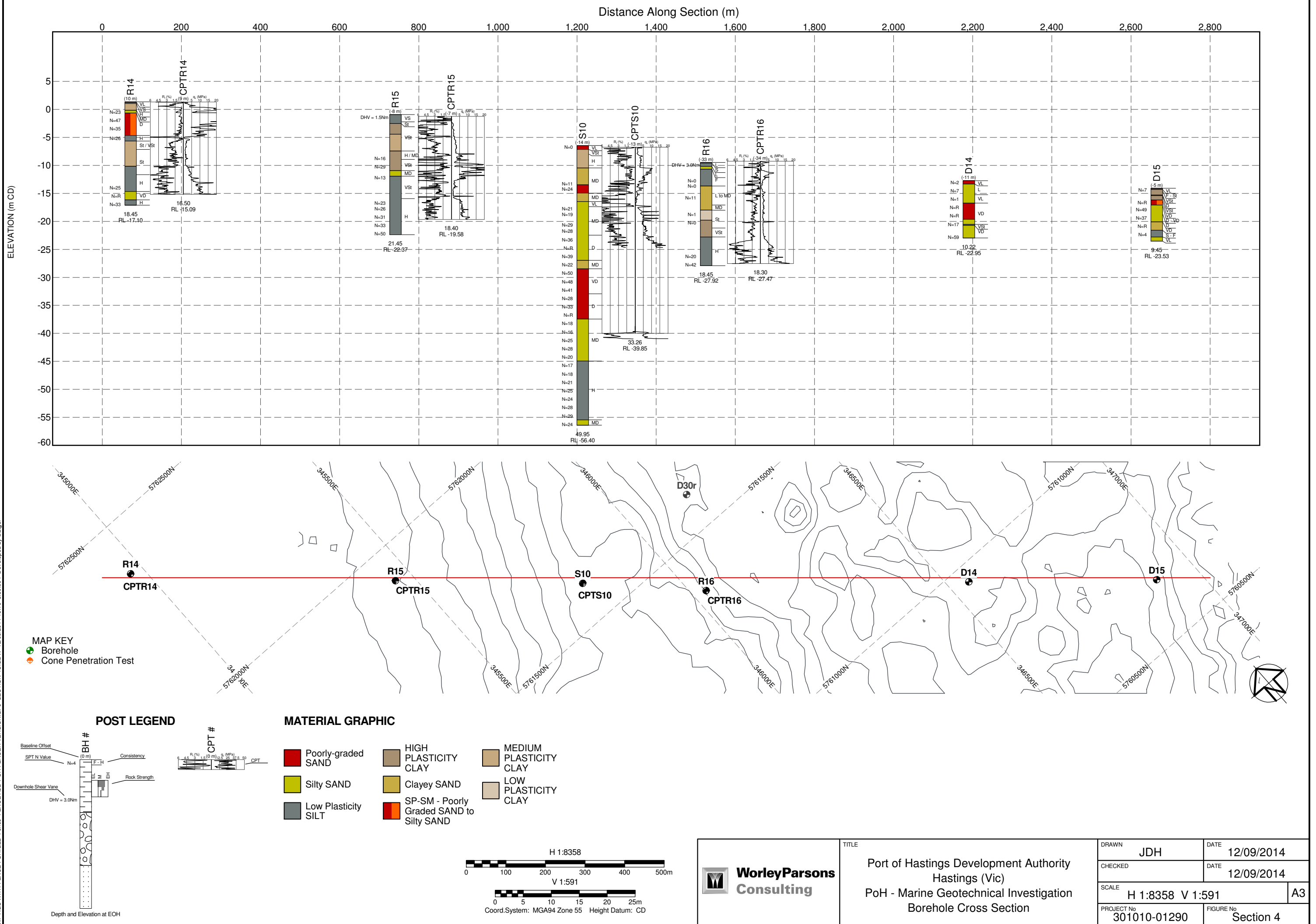
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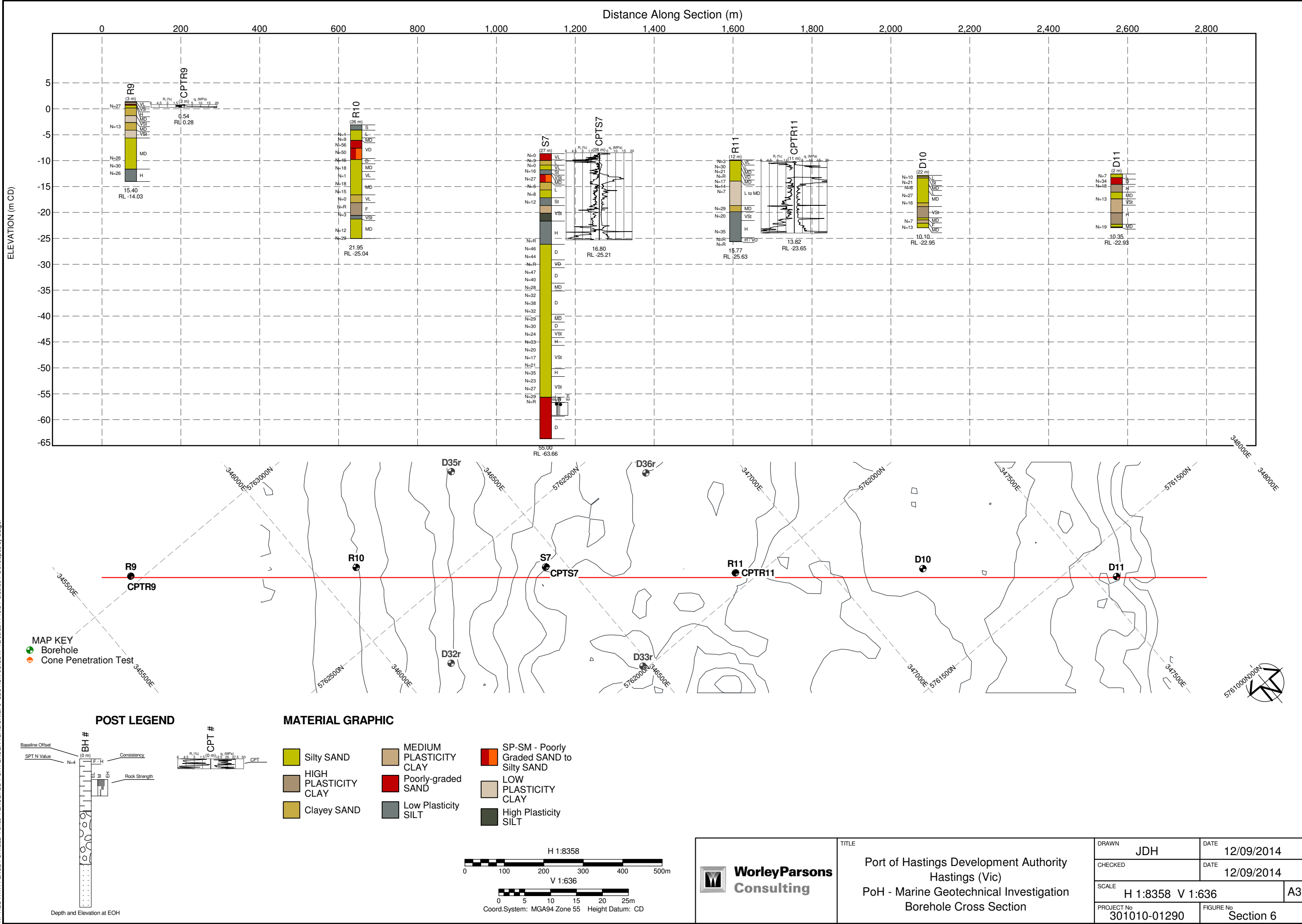
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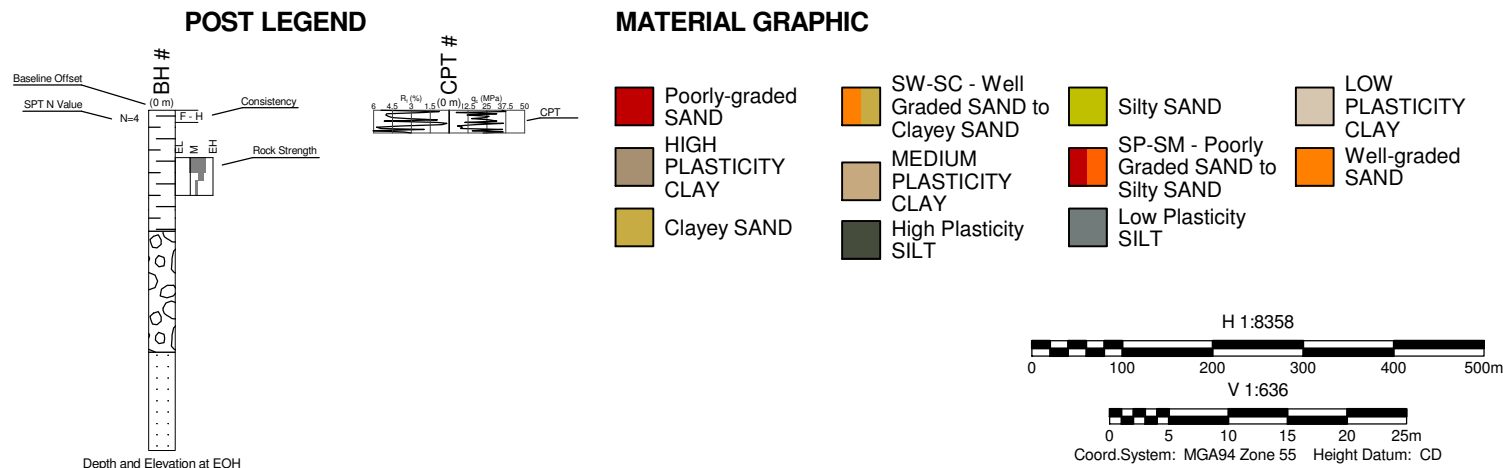
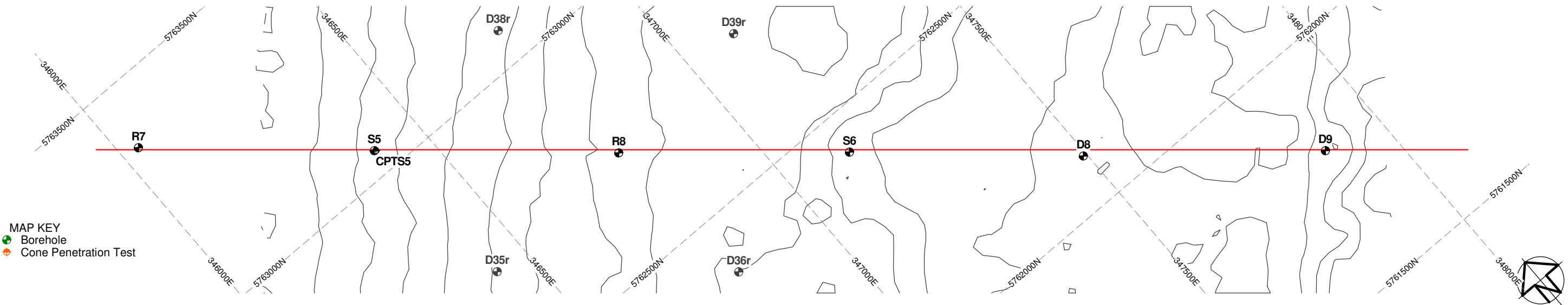
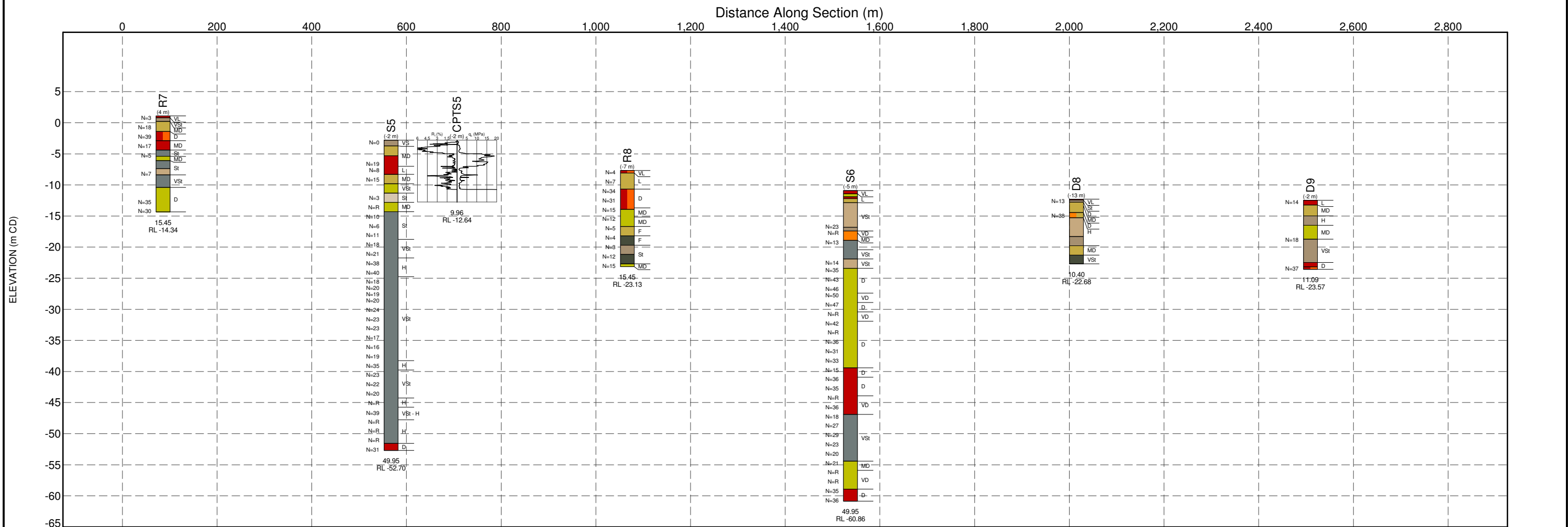
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WP AGS WITH FENCE POH.GLB Fence FENCE A3L POH FENCE VERSION.GPJ SECTION 6C.GDW 12/09/2014 16:34 8.30.004 Developed by Datagel



WP AGS WITH FENCE POH.GLB Fence FENCE A3L PORT OF HASTINGS BH LOGS GPJ SECTION 7C.GDW 12/09/2014 19:25 8.30.004 Developed by Datigel

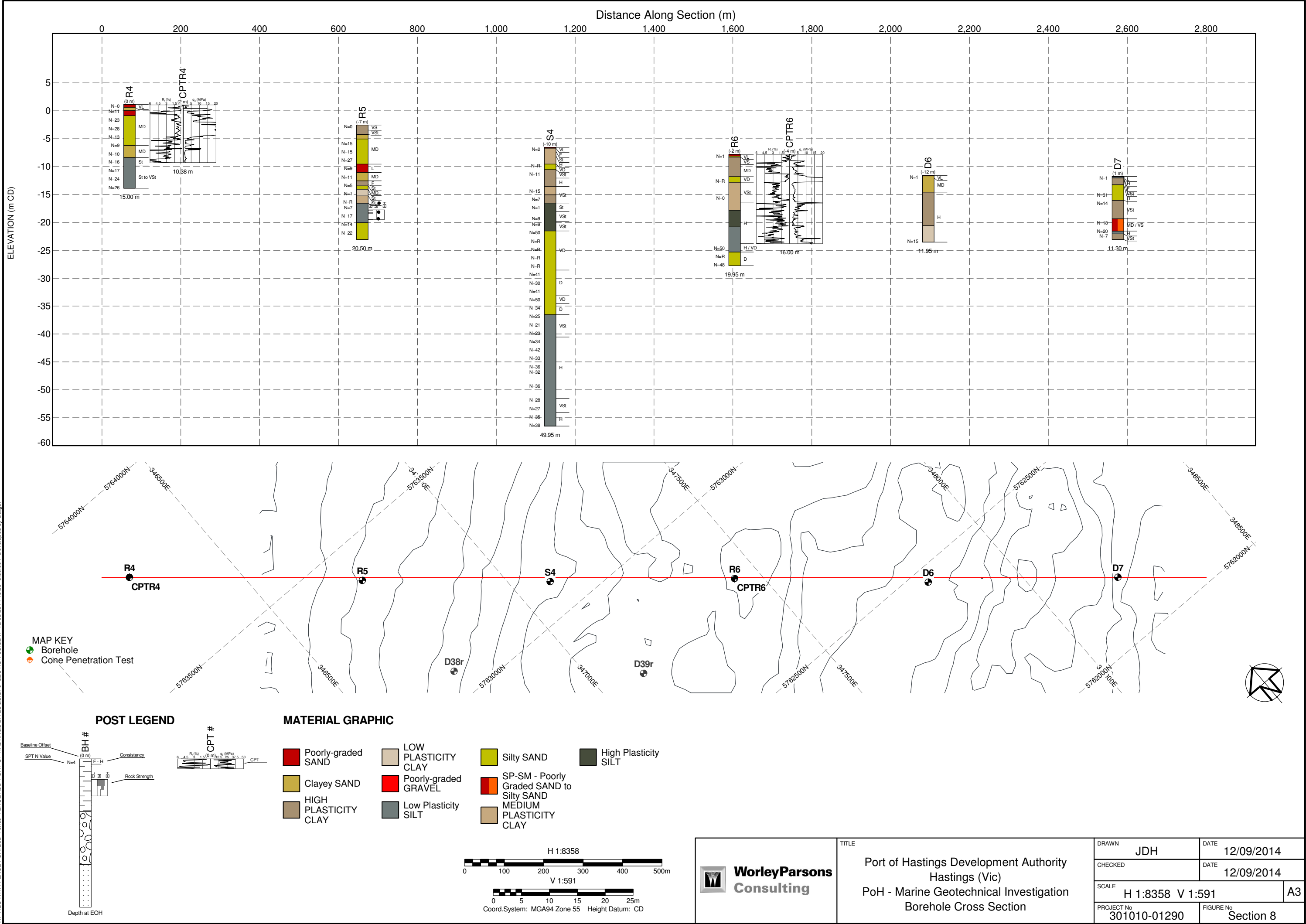


TITLE

Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
Borehole Cross Section

DRAWN	JDH	DATE	12/09/2014
CHECKED		DATE	12/09/2014
SCALE	H 1:8358 V 1:636		A3
PROJECT No	301010-01290		FIGURE No
		Section 7	

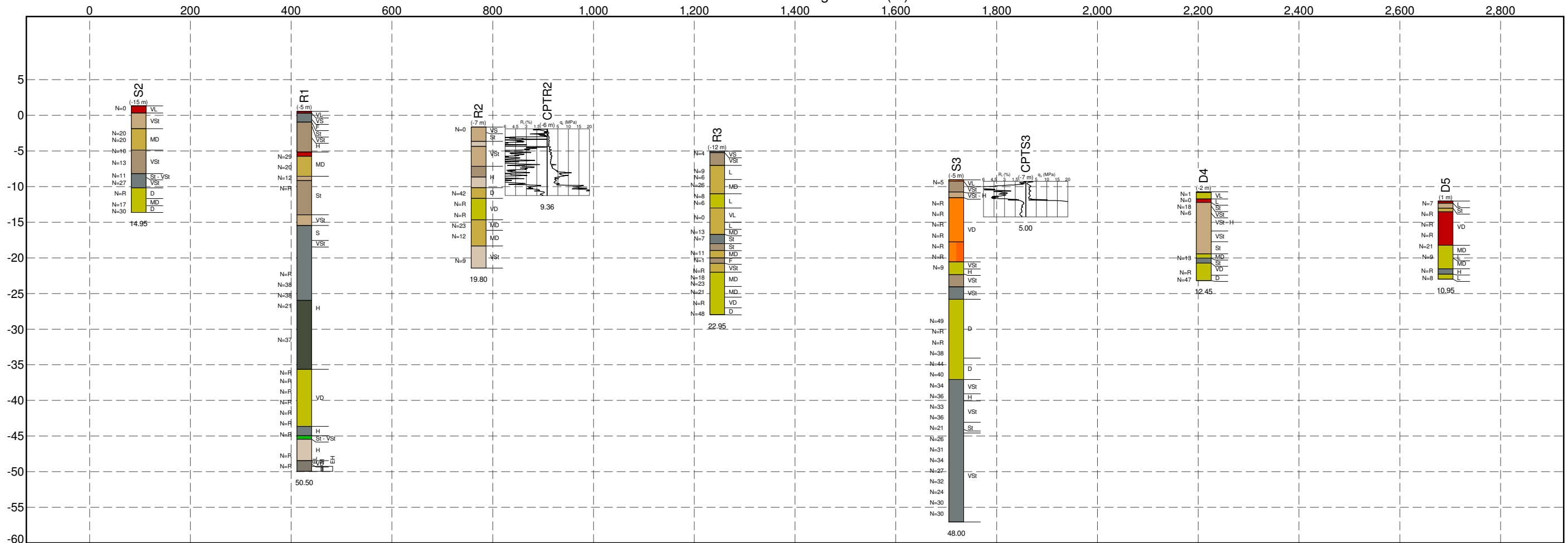
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WP AGS WITH FENCE POH.GLB Fence FENCE A3L SECTION 9C.GDW 13/09/2014 10:15 8.30.004 Developed by Datgel

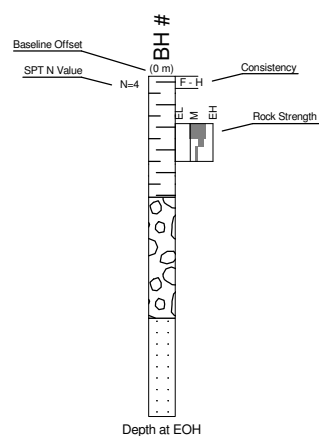
ELEVATION (m CD)

Distance Along Section (m)

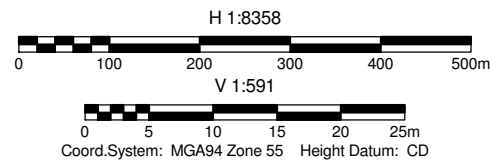
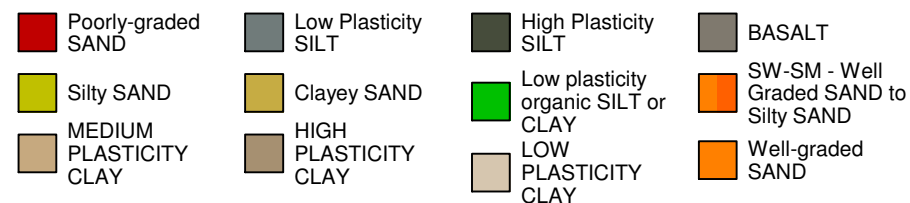


MAP KEY
● Borehole
● Cone Penetration Test

POST LEGEND



MATERIAL GRAPHIC



WorleyParsons
Consulting

TITLE

Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
Borehole Cross Section

DRAWN

JDH

DATE

13/09/2014

CHECKED

DATE

13/09/2014

SCALE

H 1:8358 V 1:591

A3

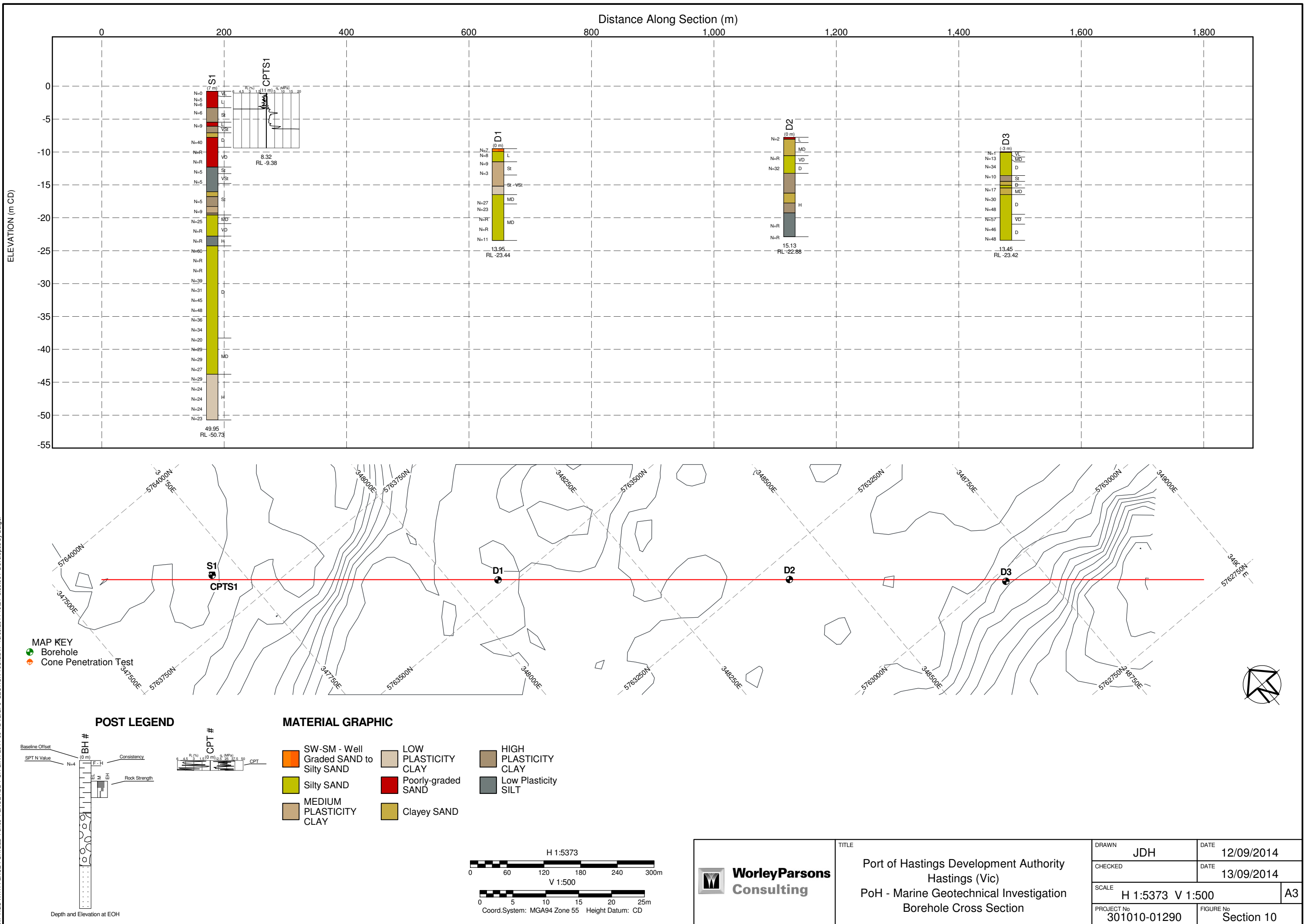
PROJECT No

301010-01290

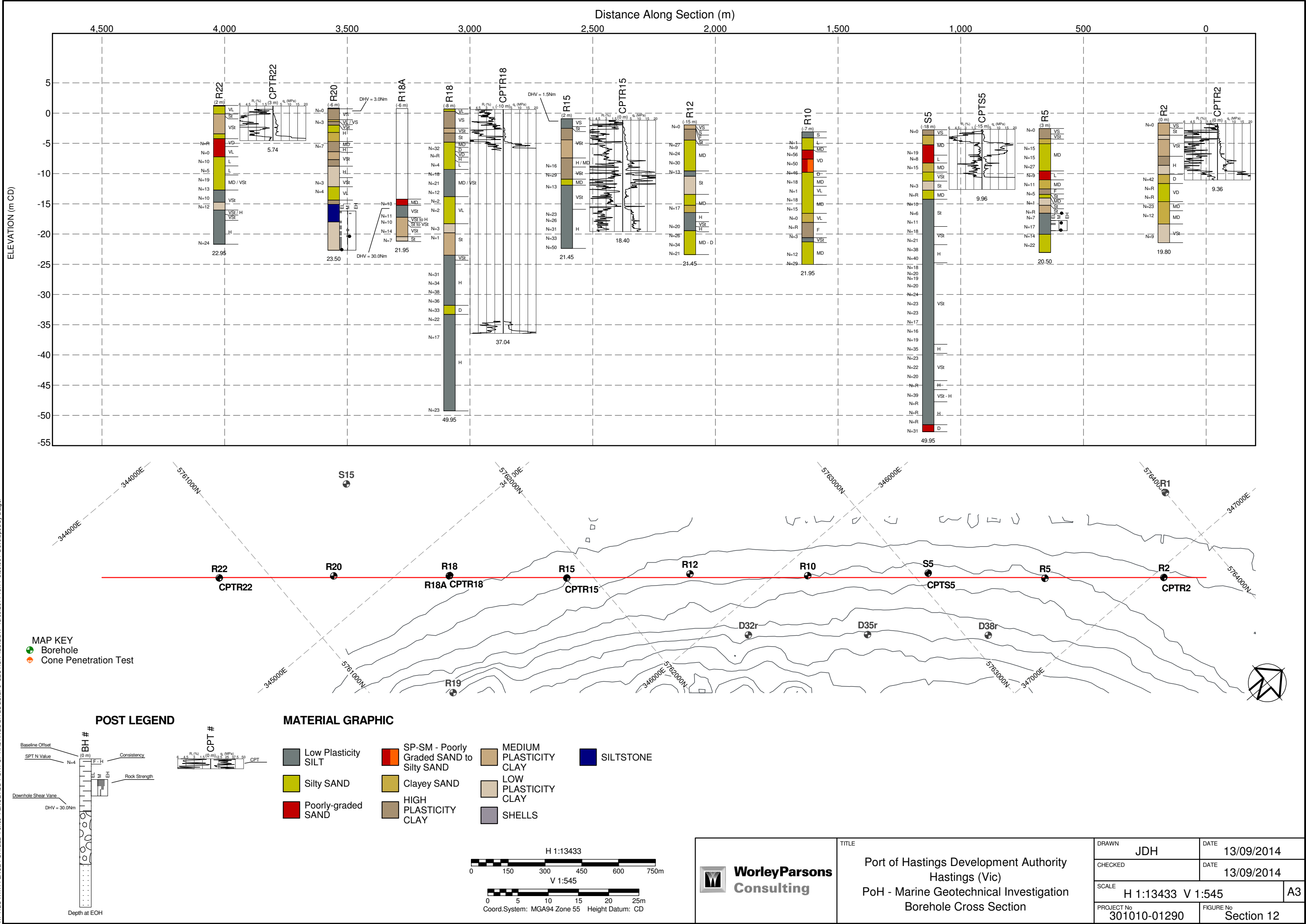
FIGURE No

Section 9

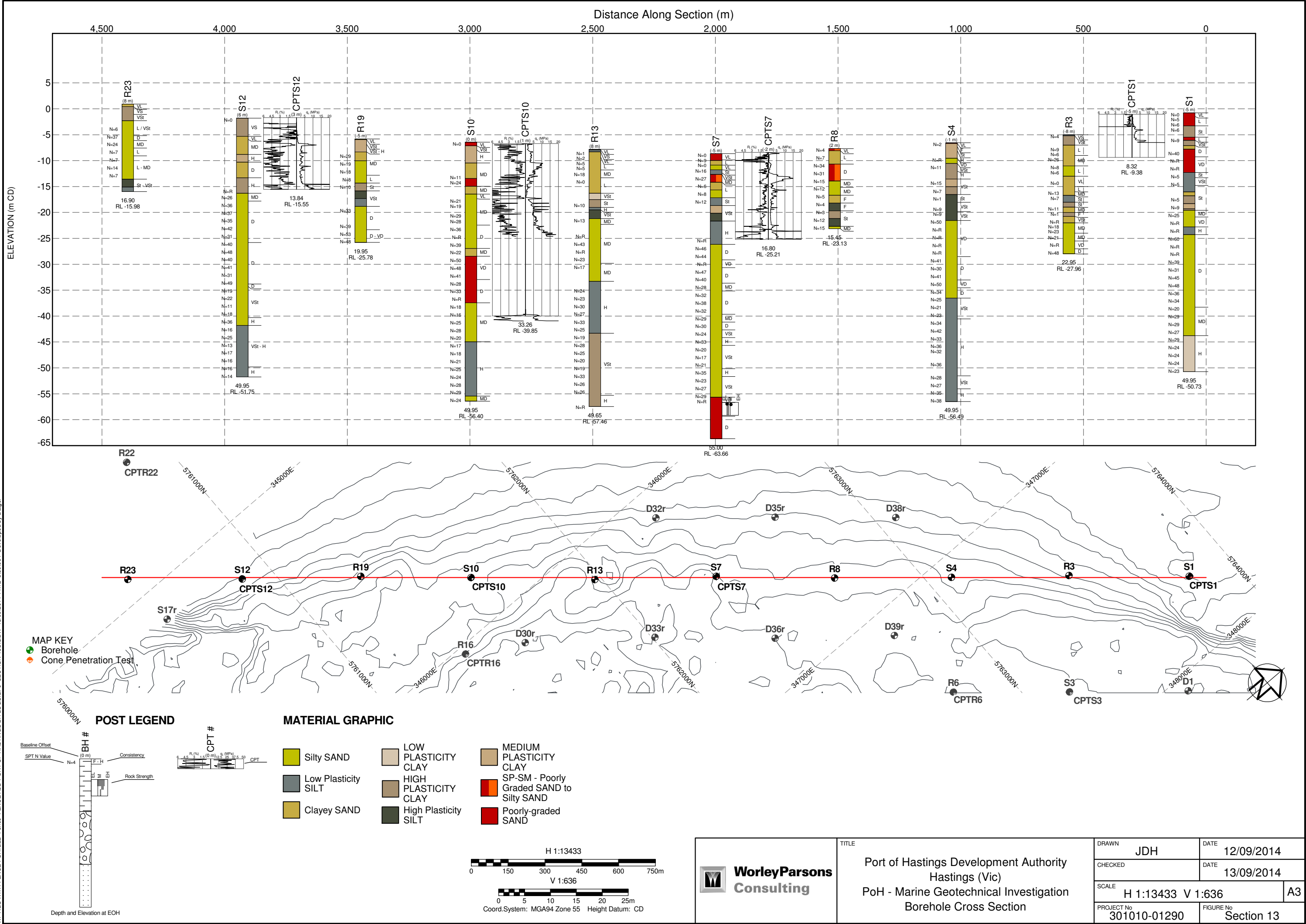
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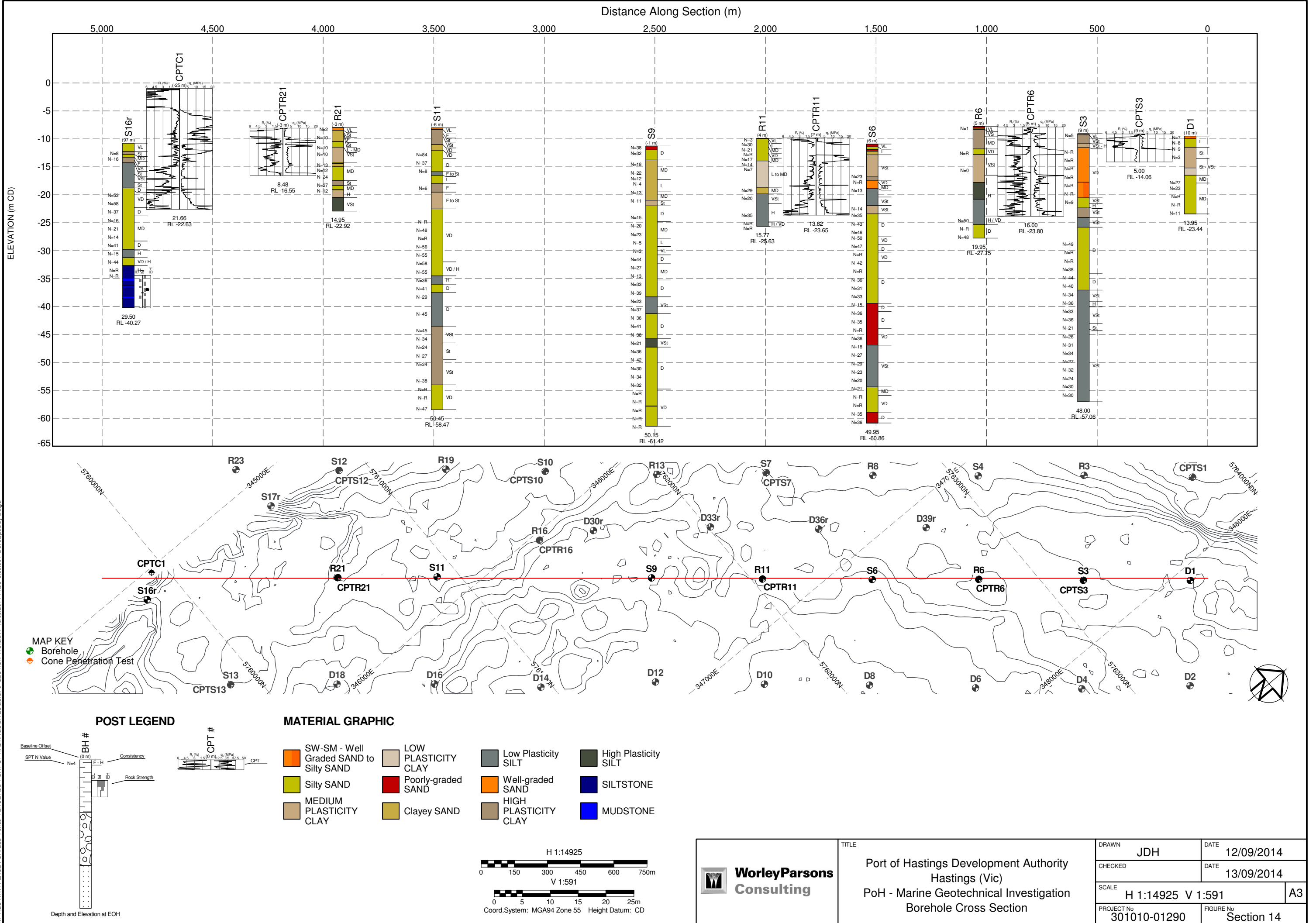
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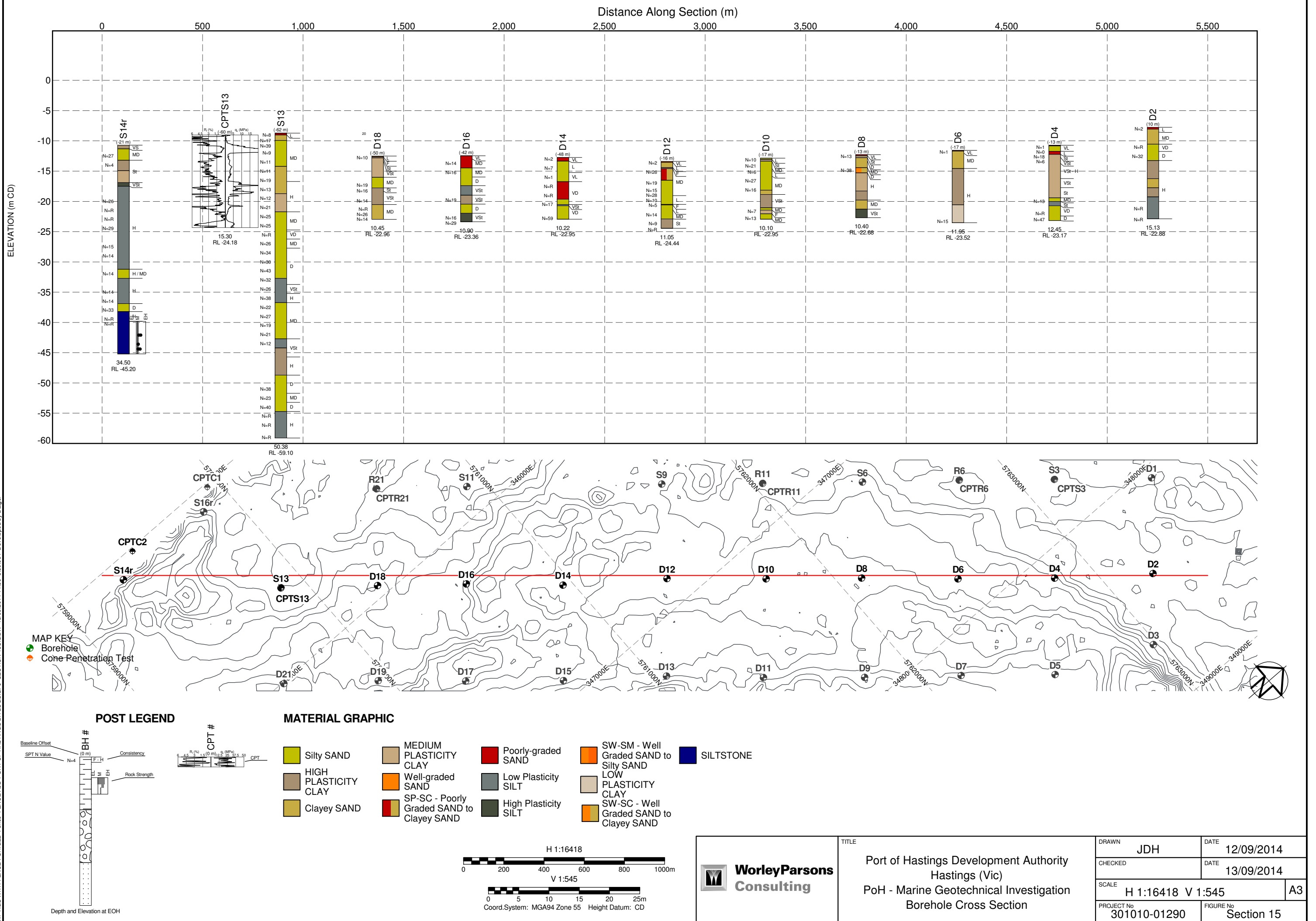
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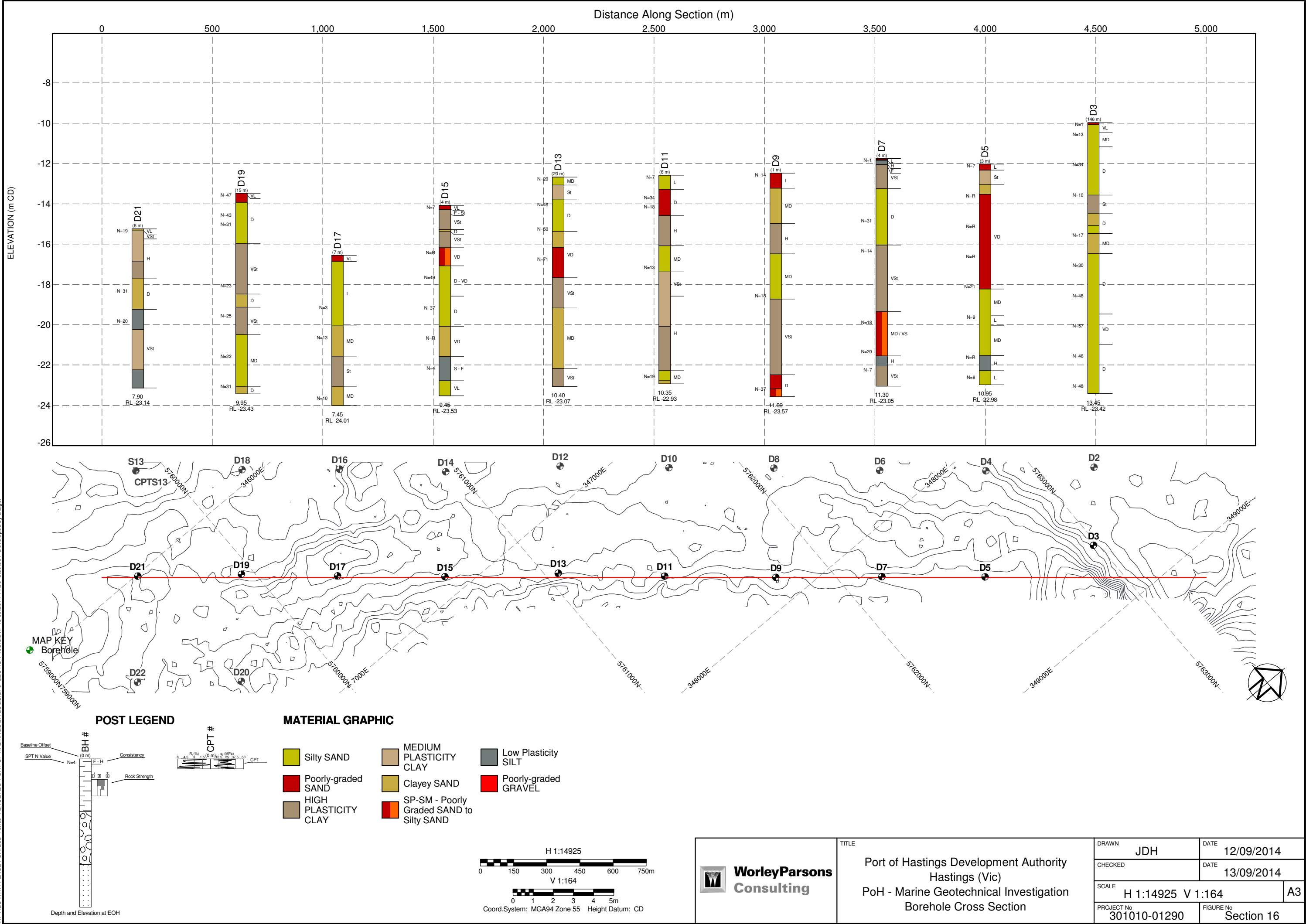
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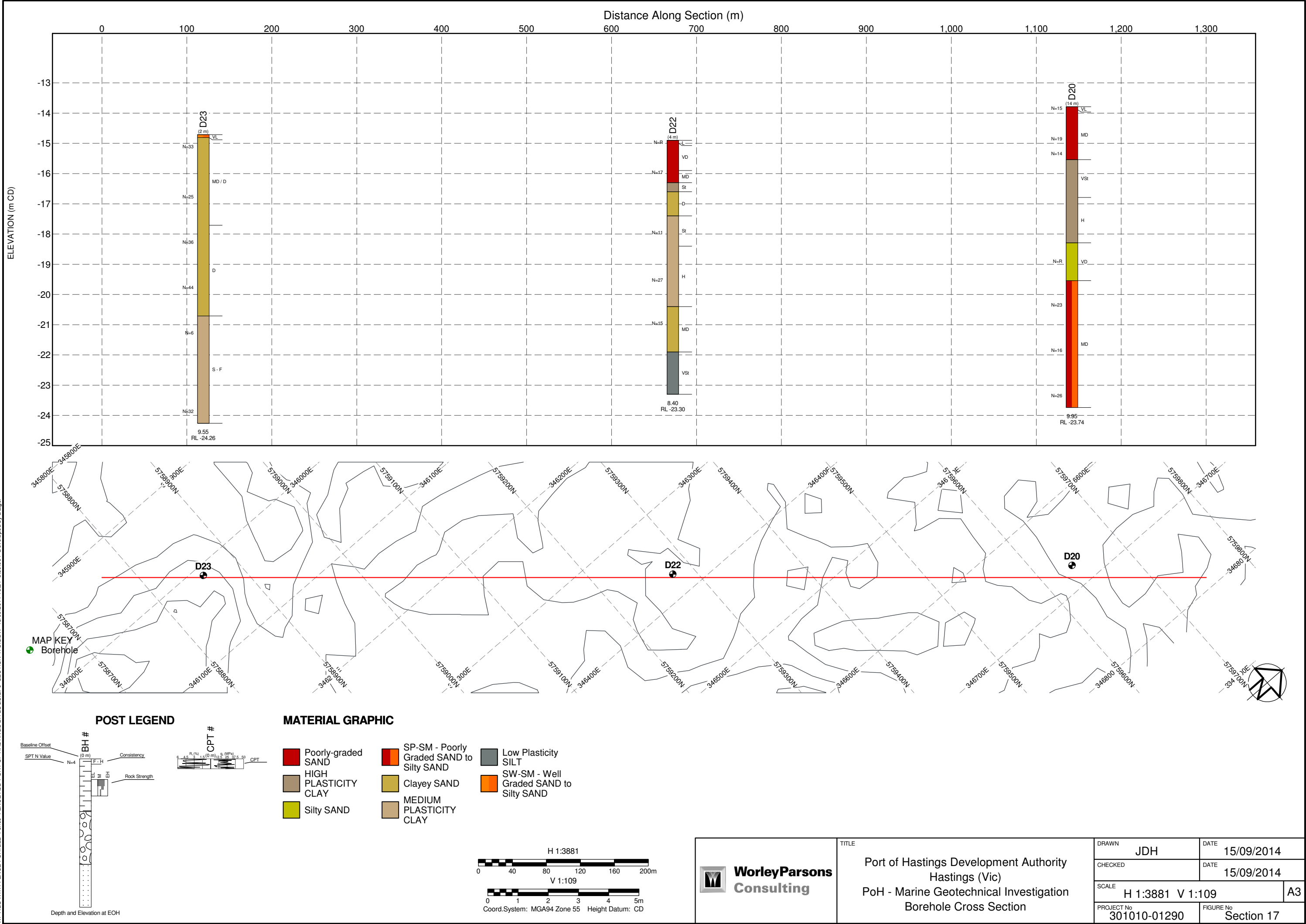
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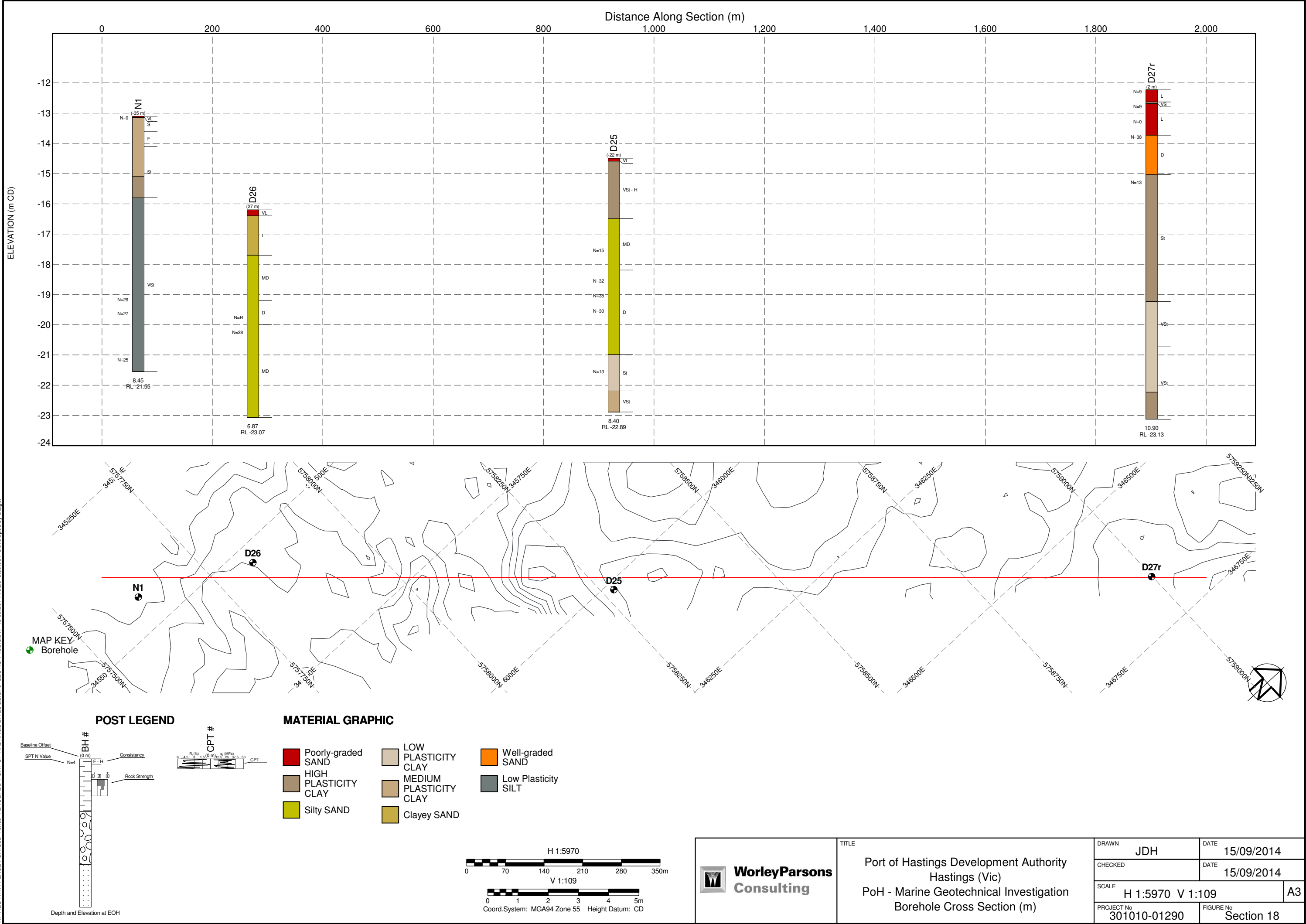
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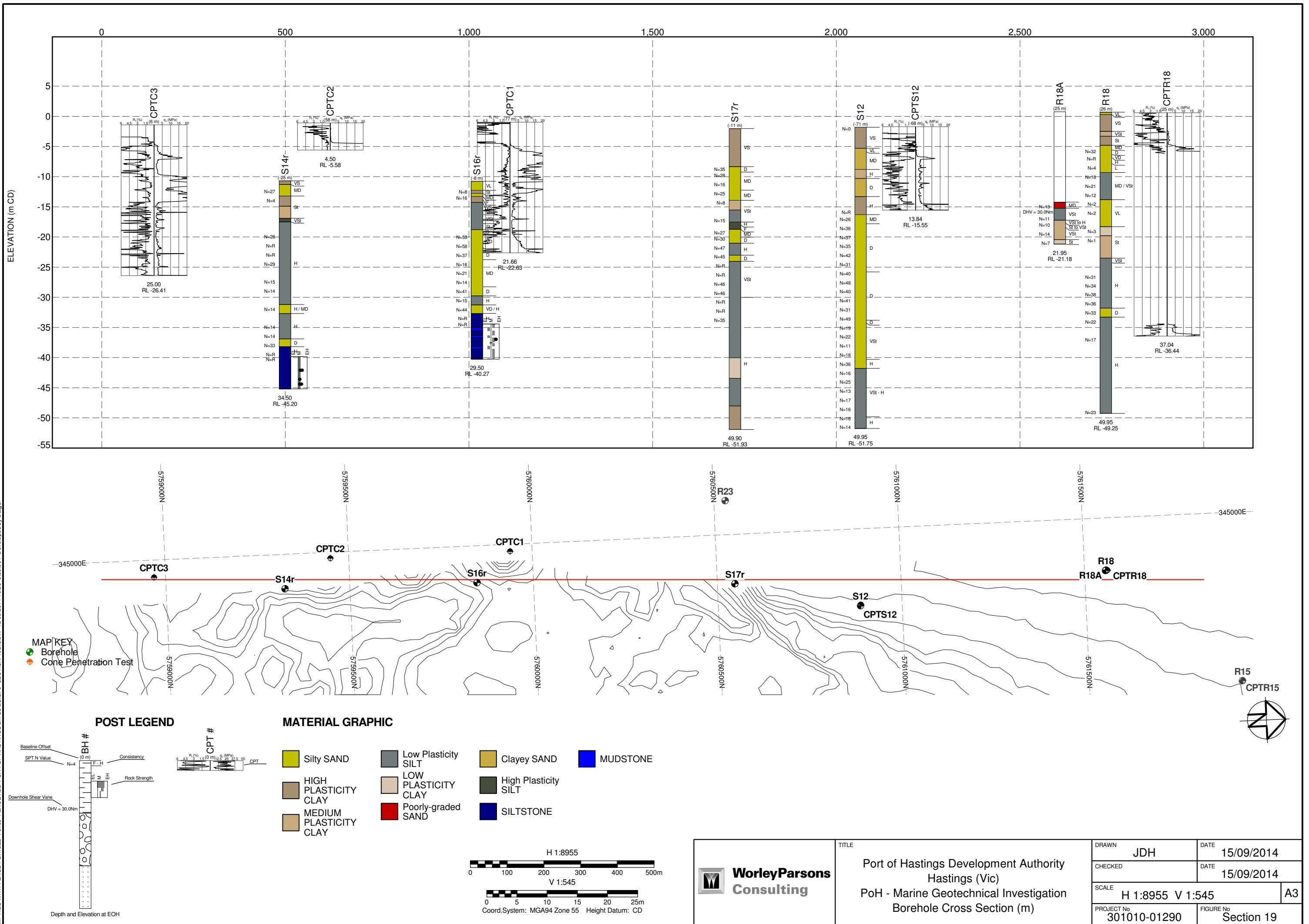
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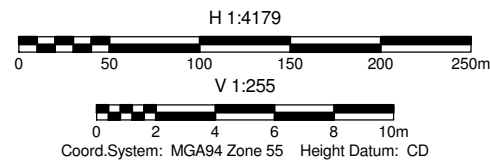
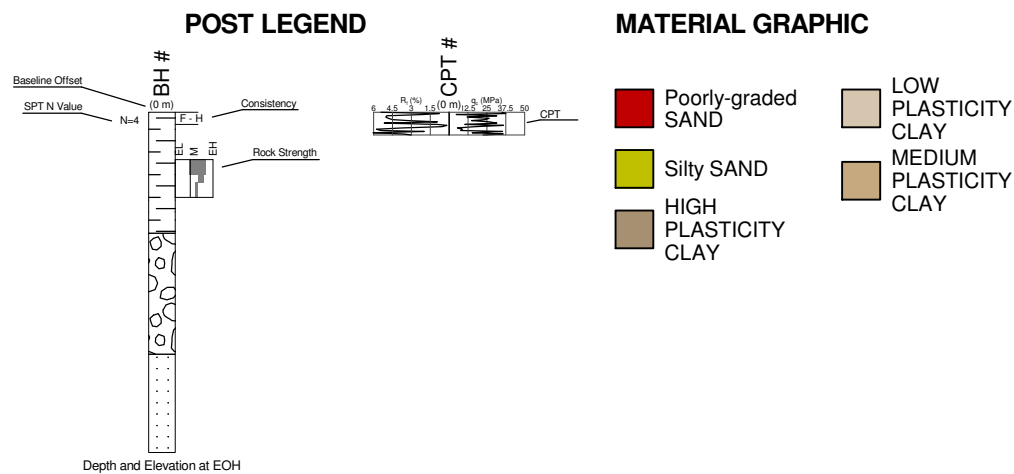
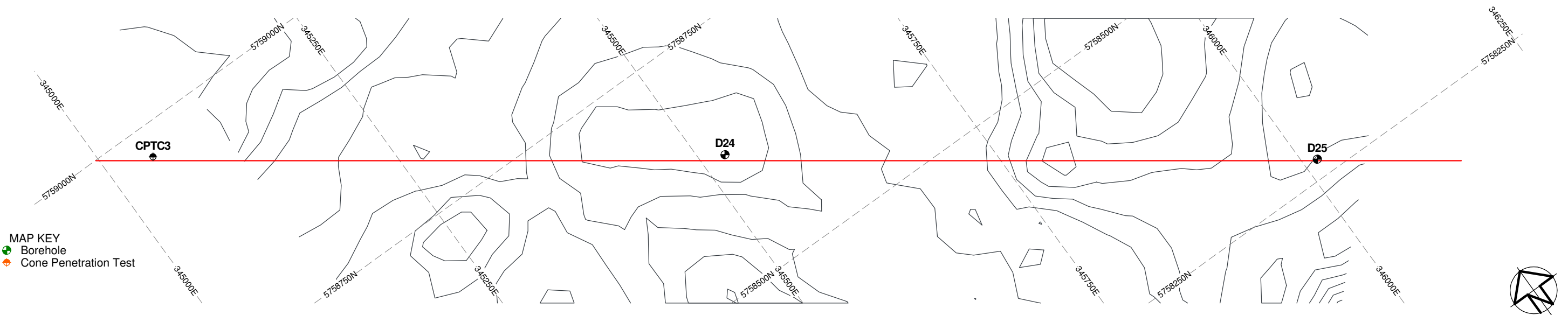
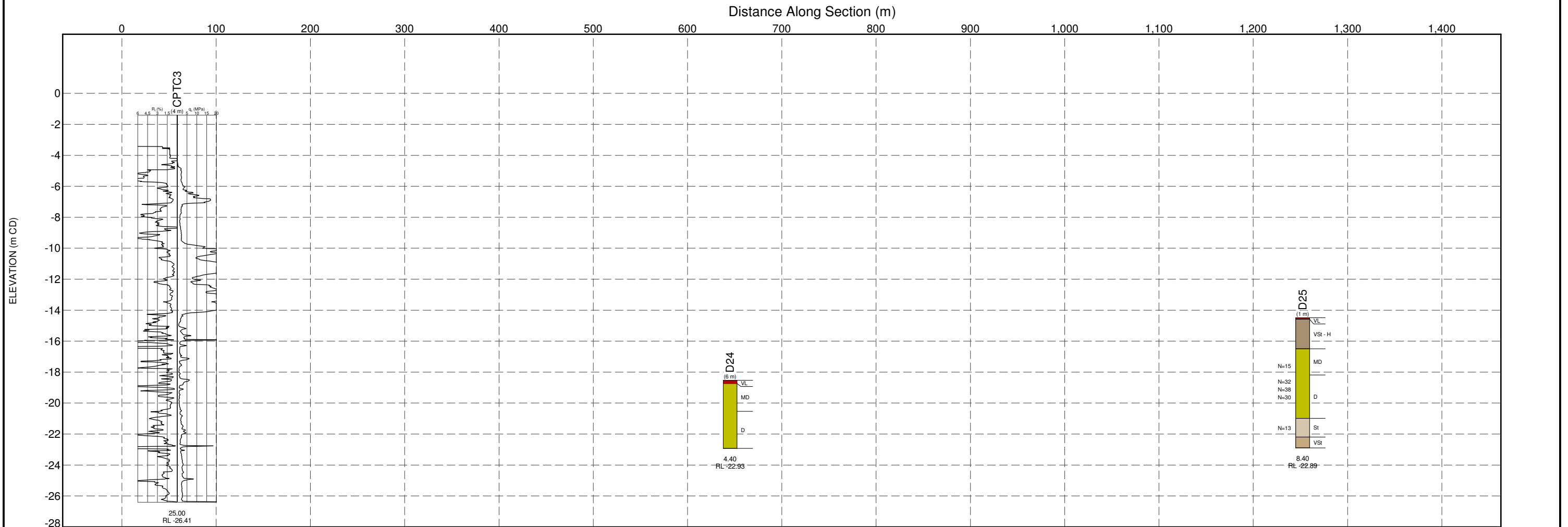
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WP AGS WITH FENCE POH.GLB Fence FENCE A3L PORT OF HASTINGS BH LOGS GPJ SECTION 19C.GDW 15/09/2014 10:35 8.30.004 Developed by Datigel



WP AGS WITH FENCE POH.GLB Fence FENCE A3L POH FENCE VERSION.GPJ SECTION 20C.GDW 11/09/2014 09:15 8.30.004 Developed by Datigel



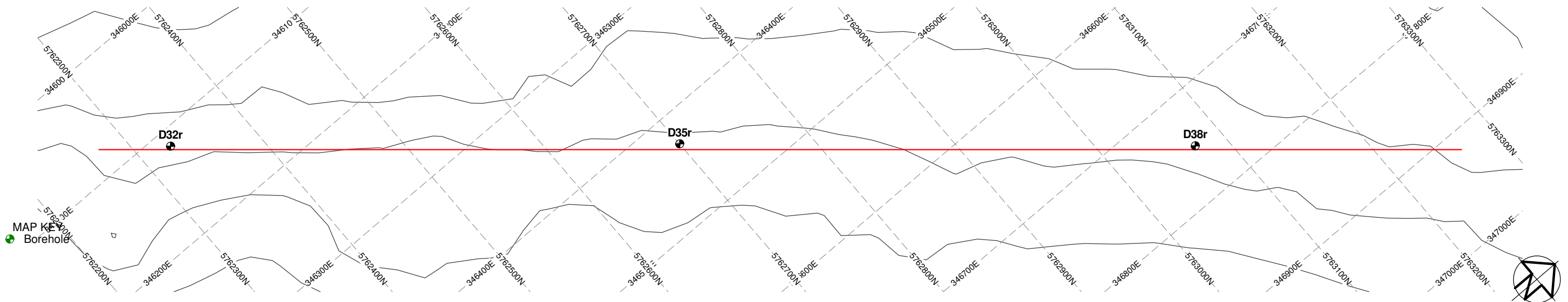
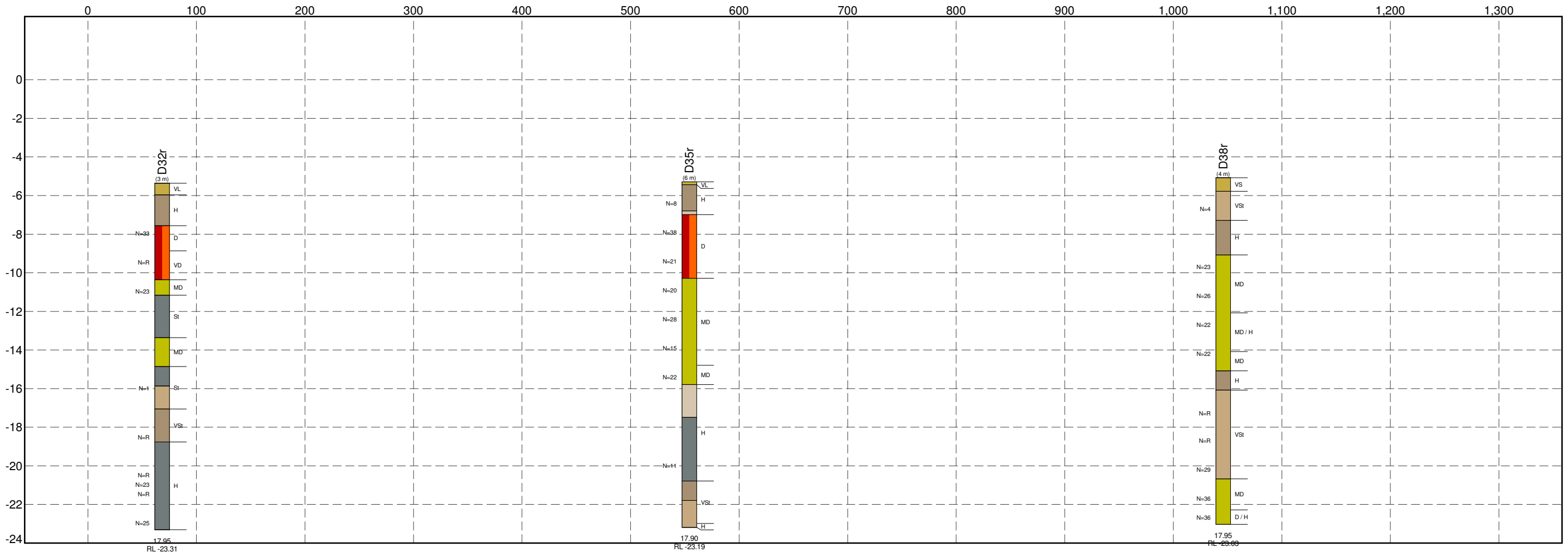
TITLE

Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
Borehole Cross Section

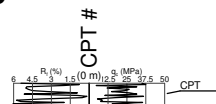
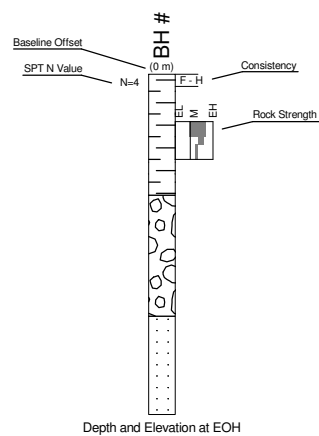
DRAWN	JDH	DATE	10/09/2014
CHECKED		DATE	11/09/2014
SCALE	H 1:4179 V 1:255		A3
PROJECT No	301010-01290		FIGURE No
		Section 20	

WP AGS WITH FENCE POH.GLB Fence FENCE A3L PORT OF HASTINGS BH LOGS GPJ SECTION 21C.GDW 15/09/2014 10:47 8.30.004 Developed by Datatel

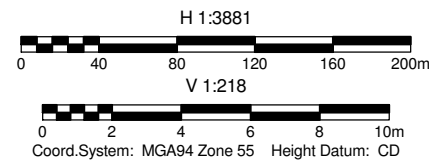
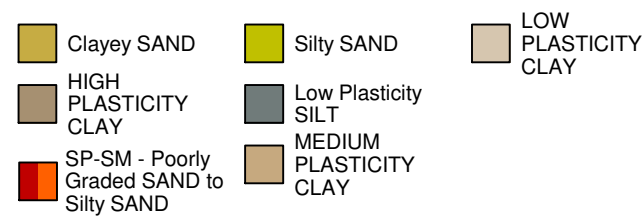
ELEVATION (m CD)



POST LEGEND



MATERIAL GRAPHIC



WorleyParsons
Consulting

TITLE

Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
Borehole Cross Section

DRAWN

JDH

DATE

15/09/2014

CHECKED

DATE

15/09/2014

SCALE

H 1:3881 V 1:218

A3

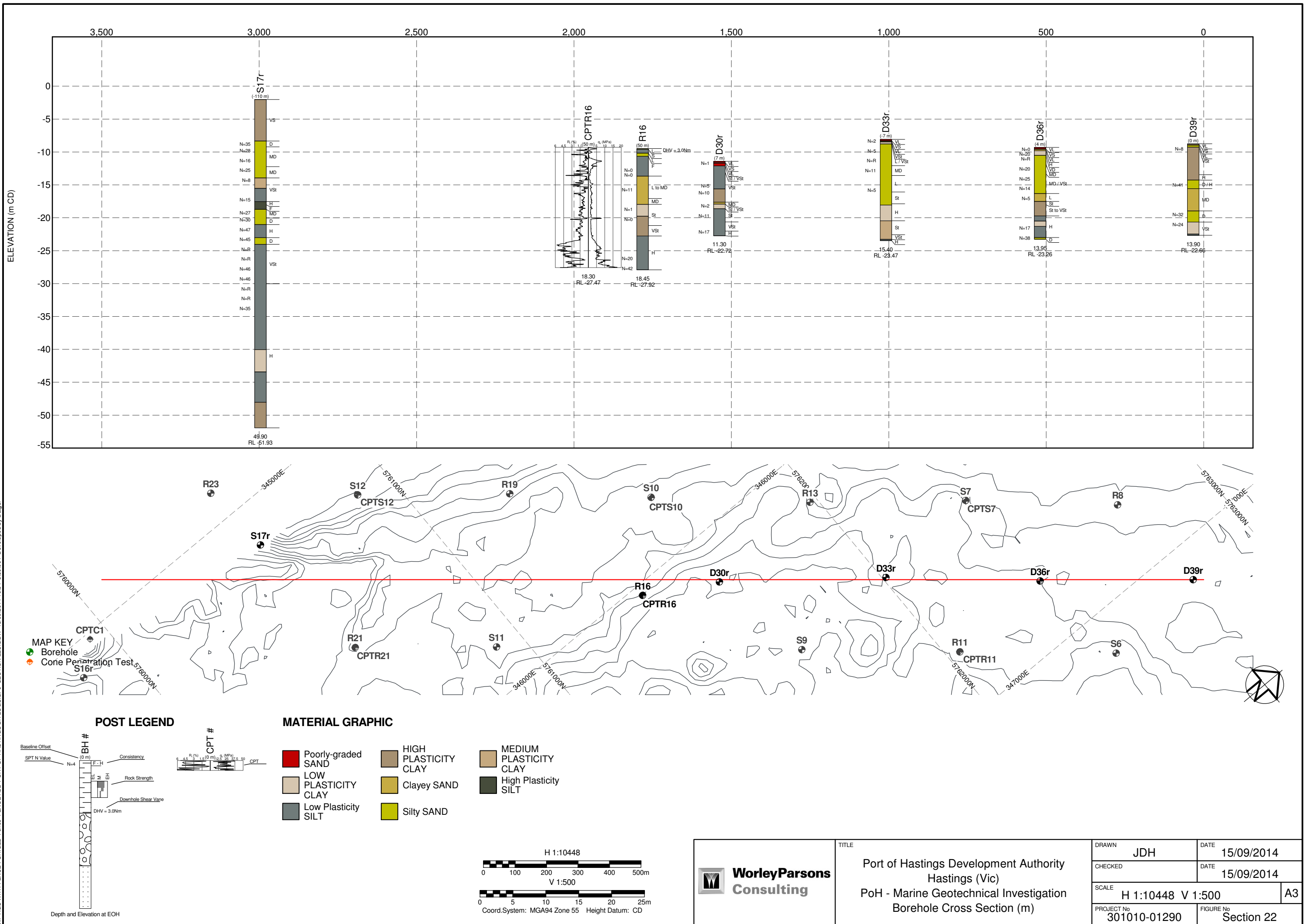
PROJECT No

301010-01290

FIGURE No

Section 21

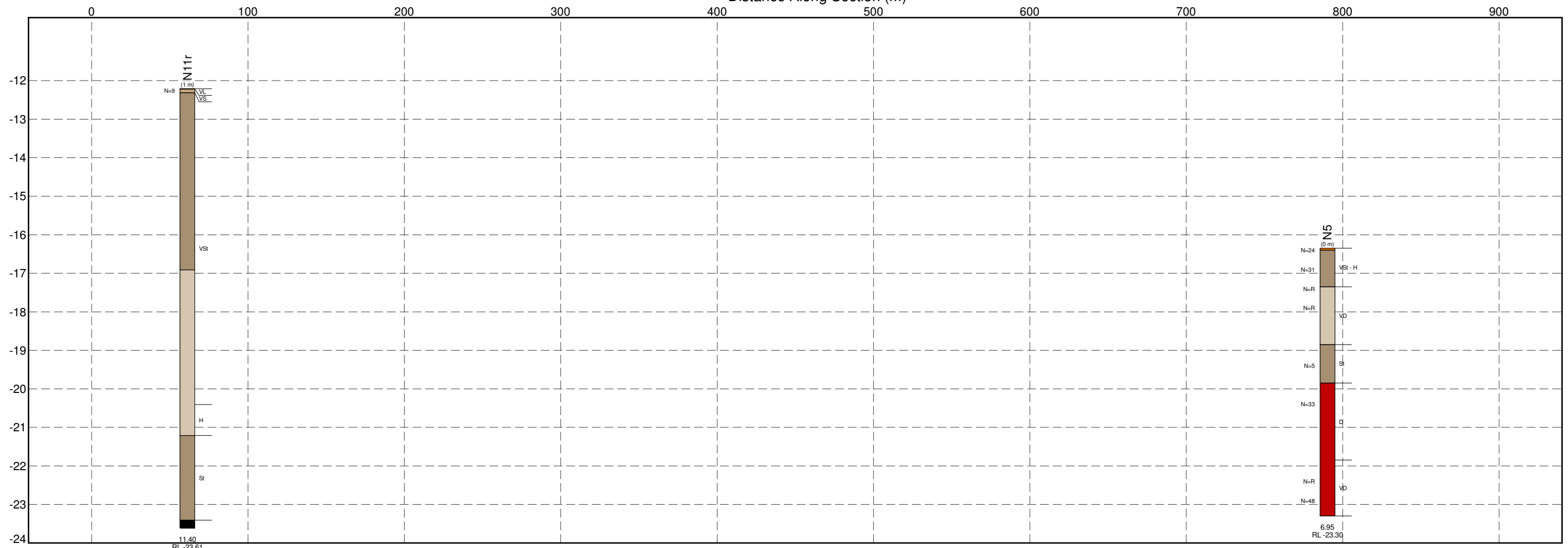
WP AGS WITH FENCE POH.GLB Fence FENCE A3L PORT OF HASTINGS BH LOGS GPJ SECTION 22C.GDW 15/09/2014 10:54 8.30.004 Developed by Datatel



WP AGS WITH FENCE POH.GLB Fence FENCE A3L POH FENCE VERSION.GPJ SECTION 24.B.GDW 11/09/2014 12:39 8.30.004 Developed by Datgel

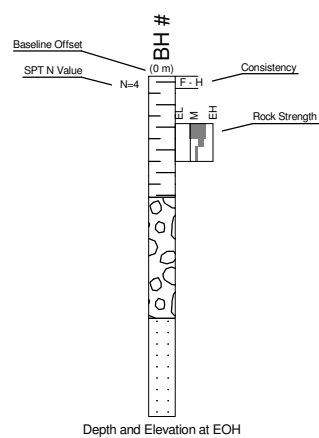
ELEVATION (m CD)

Distance Along Section (m)



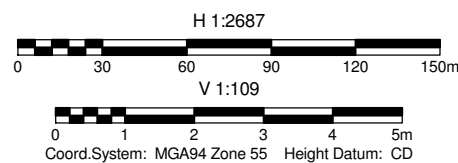
MAP KEY
● Borehole

POST LEGEND



MATERIAL GRAPHIC

- | | |
|------------------------|---------------------|
| Poorly-graded SAND | LOW PLASTICITY CLAY |
| MEDIUM PLASTICITY CLAY | COAL |
| PLASTICITY CLAY | Well-graded SAND |



TITLE

Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
Borehole Cross Section

DRAWN

JDH

DATE

11/09/2014

CHECKED

DATE

11/09/2014

SCALE

H 1:2687 V 1:109

A3

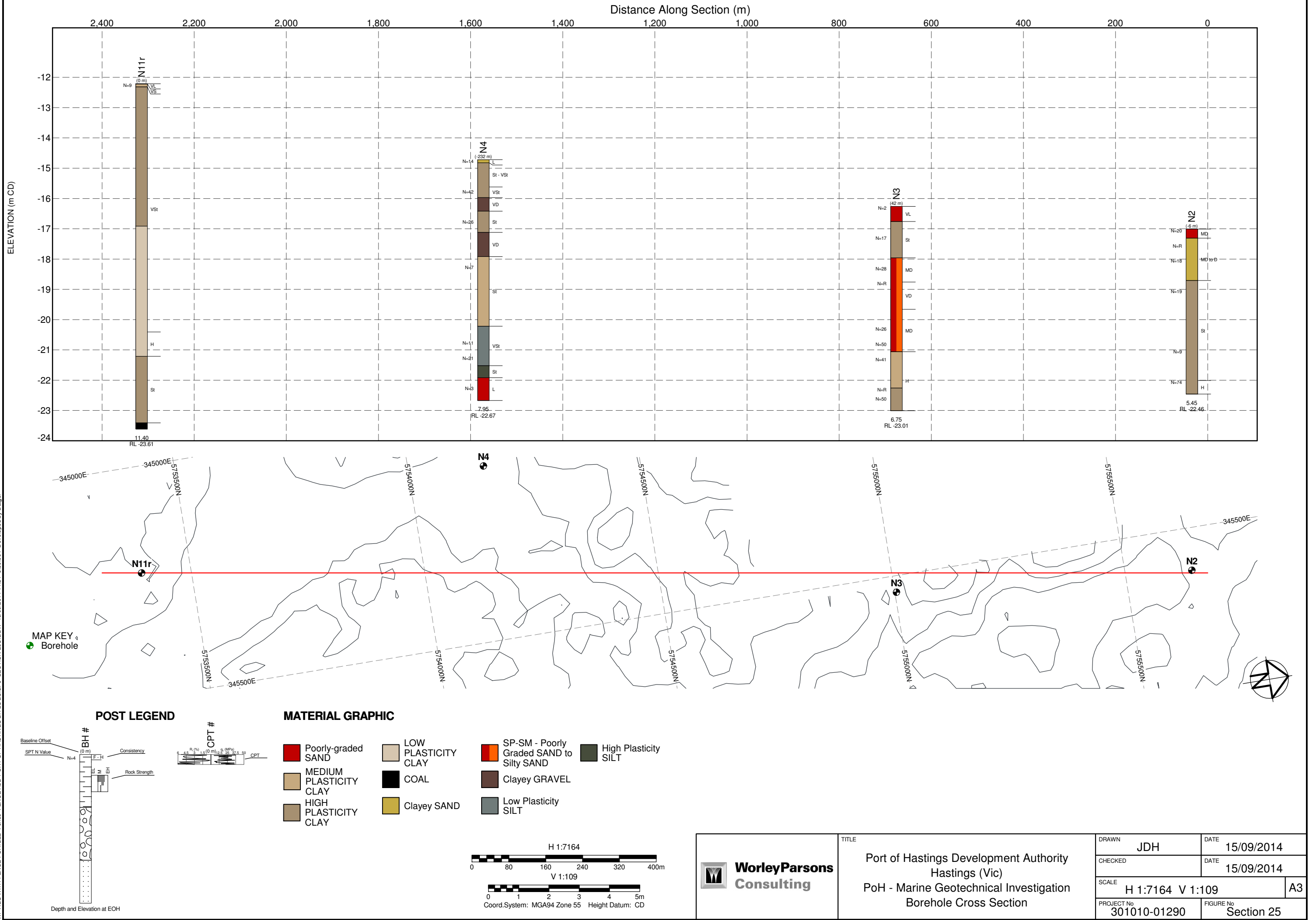
PROJECT No

301010-01290

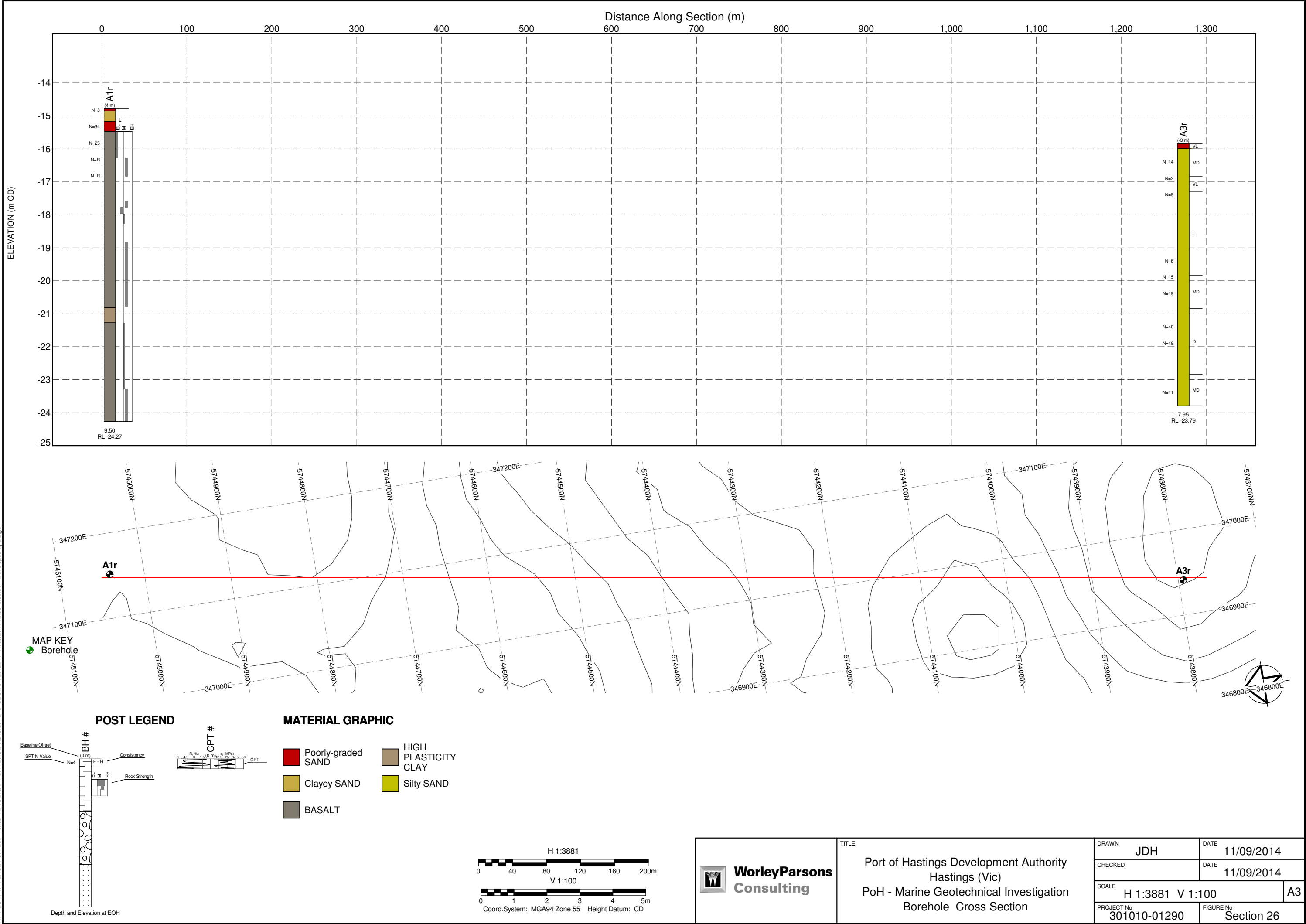
FIGURE No

Section 24

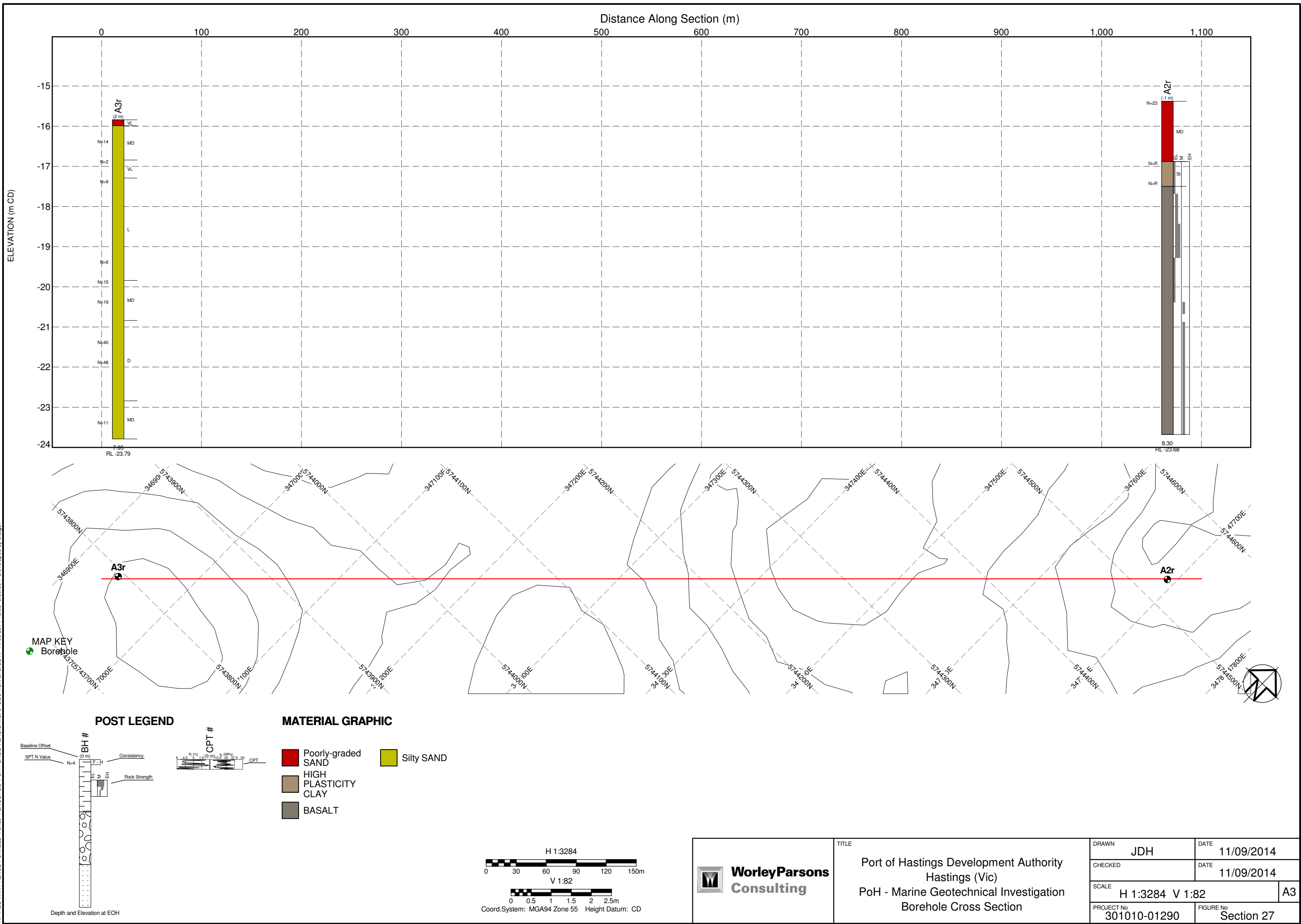
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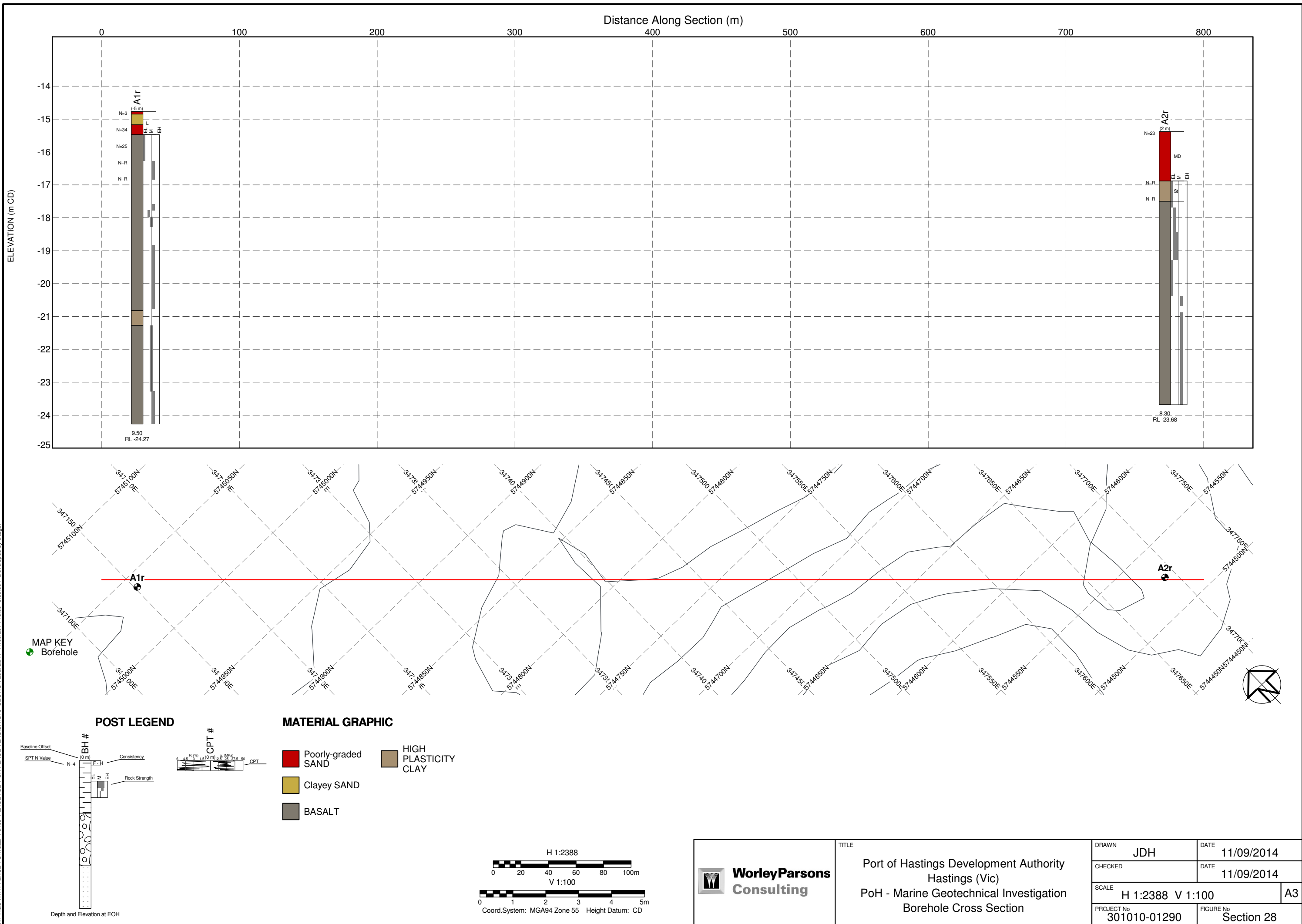
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WP AGS WITH FENCE POH.GLB Fence FENCE A3L POH FENCE VERSION.GPJ SECTION 27.FLGDW 11/09/2014 13:03 8.30.004 Developed by Datigel



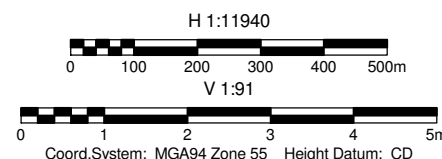
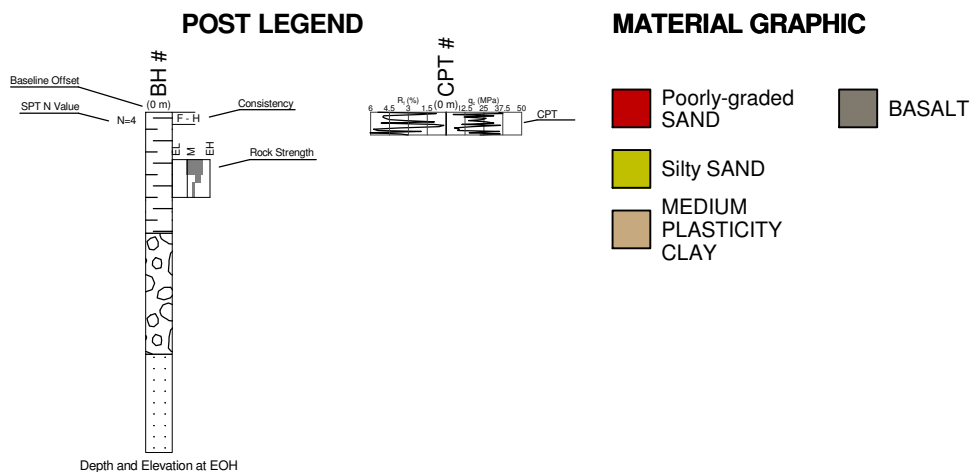
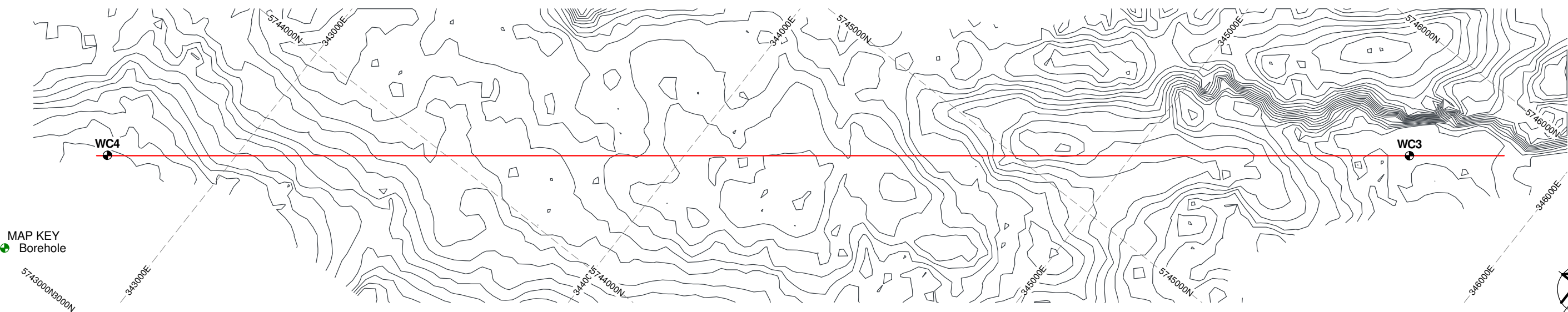
WP AGS WITH FENCE POH.GLB Fence FENCE VERSION GPJ SECTION 28.E.GDW 11/09/2014 13:09 8.30.004 Developed by Datigel



WP AGS WITH FENCE POH.GLB Fence FENCE VERSION GPJ SECTION 28B.GDW 11/09/2014 13:13 8.30.004 Developed by Datgel

ELEVATION (m CD)

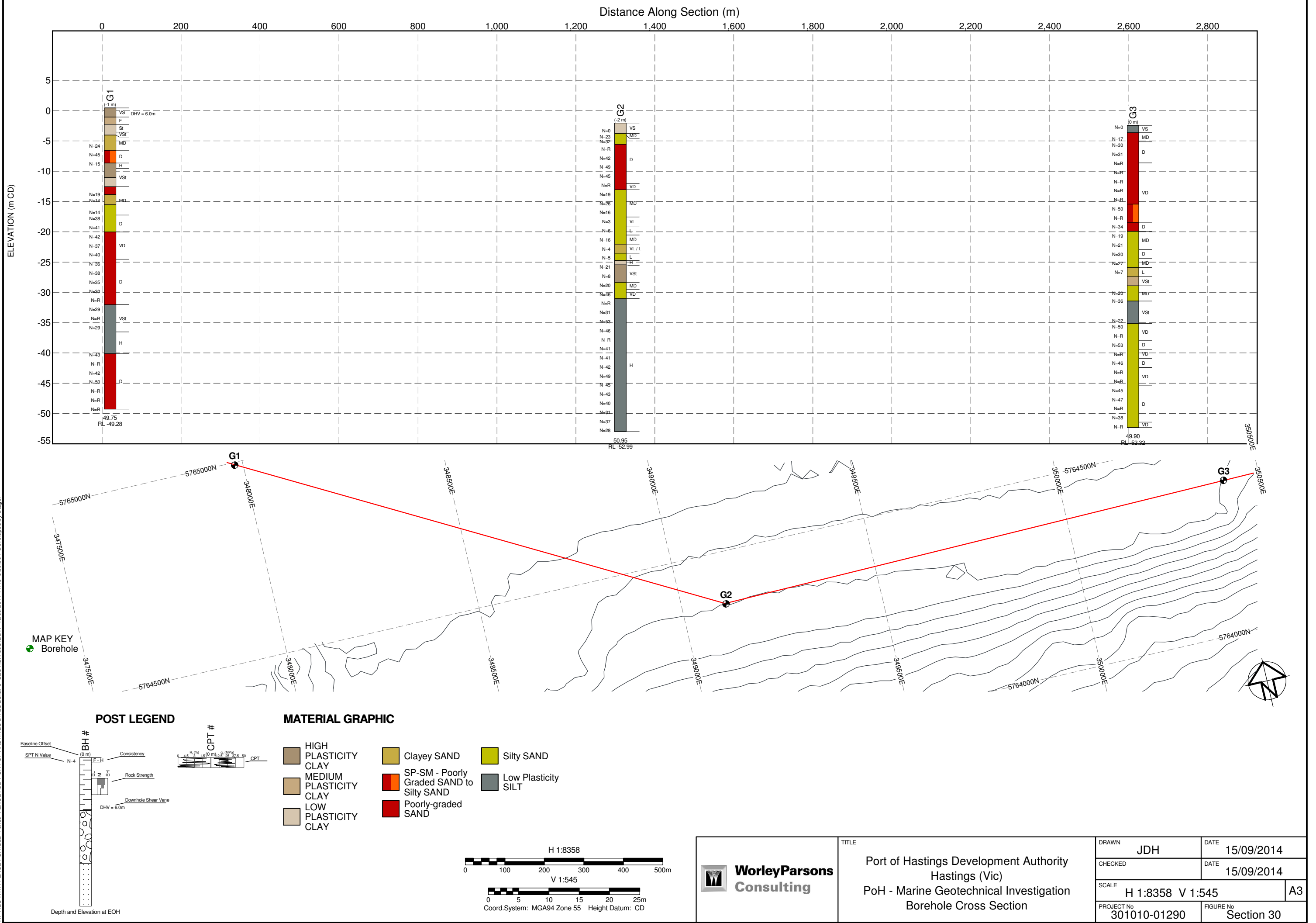
Distance Along Section (m)



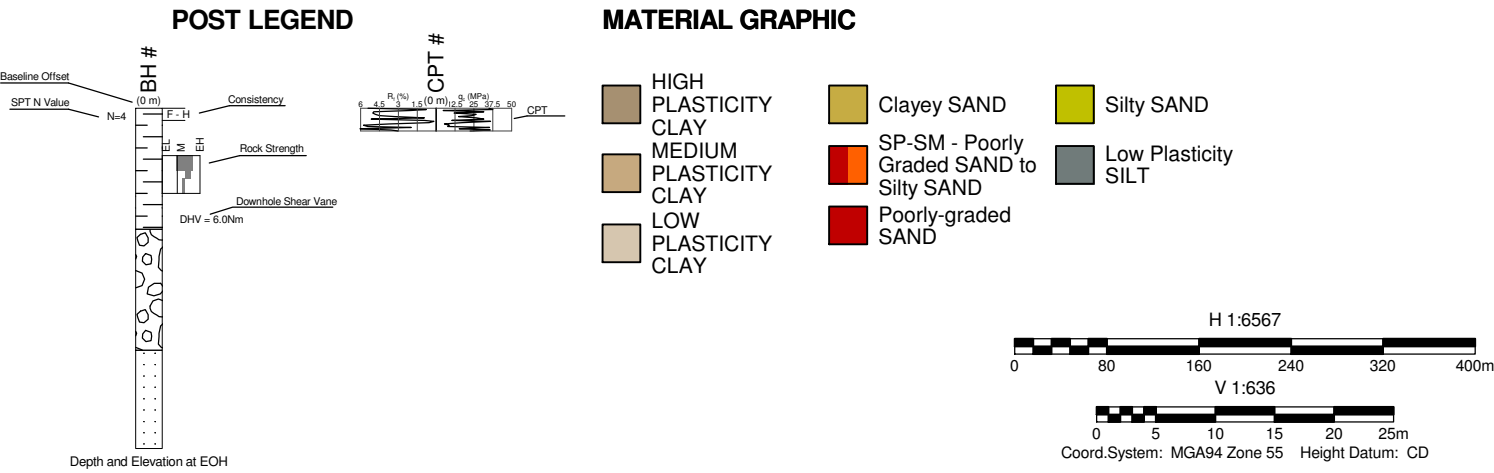
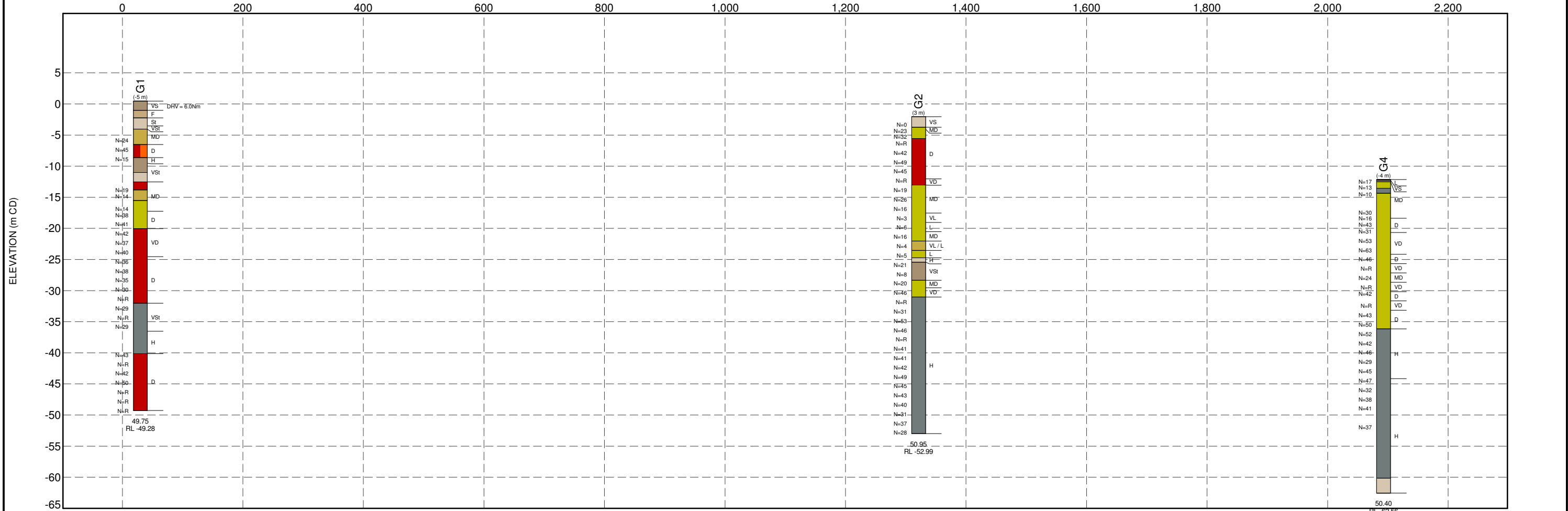
TITLE
Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
Borehole Cross Section

DRAWN	JDH	DATE	11/09/2014
CHECKED		DATE	11/09/2014
SCALE	H 1:11940 V 1:91		A3
PROJECT No	301010-01290	FIGURE No	Section 29

WP AGS WITH FENCE POH.GLB Fence FENCE A3L PORT OF HASTINGS BH LOGS GPJ SECTION 30C.GDW 15/09/2014 11:45 8.30.004 Developed by Datapel



WP AGS WITH FENCE POH.GLB Fence FENCE A3L PORT OF HASTINGS BH LOGS GPJ SECTION 31C.GDW 15/09/2014 12:01 8.30.004 Developed by Datatel



TITLE
Port of Hastings Development Authority
Hastings (Vic)
PoH - Marine Geotechnical Investigation
Borehole Cross Section

DRAWN	JDH	DATE	15/09/2014
CHECKED		DATE	15/09/2014
SCALE	H 1:6567 V 1:636		A3
PROJECT No	301010-01290		FIGURE No
		Section 31	