REPORT

Public Housing Renewal Project - Bills Street and Robinson Road, Hawthorn

Supplementary Geotechnical Investigation

Submitted to:

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1.0 ENGAGEMENT

Hayball Pty Ltd (Hayball) on behalf of their client, the Department of Health and Human Services (DHHS), has engaged Golder Associates Pty Ltd (Golder) to undertake supplementary geotechnical and environmental investigations for the proposed redevelopment of the public housing estate at 1-7 Bills Street and 151-153 Robinson Road, Hawthorn (the site) as part of the proposed Public Housing Renewal Project.

The scope of services to be provided by Golder was outlined in our proposal dated 24 July 2020 (reference 20145767-005-P-Rev0). Acceptance of our proposal and instruction to proceed with the works was provided in an email dated 27 August 2020.

This report presents the results and findings of our supplementary geotechnical investigation together with design recommendations for the proposed development in general accordance with the aims of the investigation outlined in our proposal. The information and recommendations in this report supersede those provided in our letter dated 28 September 2020 (reference 20145767-016-L-Rev0) and our draft version of this report dated 22 October 2020 (reference: 20145767-022-R-RevA).

The results and findings of the supplementary environmental investigation are presented in a separate report dated 4 November 2020 (reference 20145767-014-R-Rev0).

2.0 SITE CONDITIONS AND PROPOSED DEVELOPMENT

The site of the proposed development is approximately rectangular in plan area and about 1.08 ha in size (maximum dimensions of about 100 m north-south by 110 m east-west). Bills Street extends through the centre of the site in an east-west direction. The site slopes down from about RL 21 m AHD in the north-east corner to about RL 11.3 m AHD in the south-west corner.

We have been provided with the following drawings and information:

- A feature survey plan produced by Reeds Consulting, dated 16 November 2016 (reference 21535 version C).
- Various Hayball architectural drawings, dated 15 July to 22 July 2020.
- Various emails (dated 11 September and 25 September 2020) from Ontoit Pty Ltd (Project Managers) regarding revisions to the Hayball drawings with respect to potential basement founding levels.

We understand that the proposed development is still in concept design stage but generally comprises the construction of six new buildings (labelled Buildings A to C across the southern part of the site and E to G across the northern part of the site), with surrounding courtyards, pavements and landscaped areas. Building A is proposed to have five levels plus one lower ground carpark level, Building B four levels plus two lower ground carpark levels, Building C three levels plus two lower ground carpark levels, Building E three levels plus one lower ground level, Building F five levels plus two lower ground carpark levels and Building G six above ground levels plus two lower ground carpark levels across the western side of the building.

There are also four stepped basement carparks (labelled P1 to P4) proposed, as follows:

- P1 (located under Building A – south east part of the site): Lowest floor slab level of about RL 14.1 m AHD, with the potential for part of the basement to be deepened to about RL 12.6 m AHD over the northern part of P1. Based on the provided information we estimate a maximum retained height of about 3.5 m to 4.0 m over the northern part of the basement (if deepened) or about 2.0 m to 2.5 m if the basement is not deepened.

- P2 (located under Buildings B and C – south-west part of the site): Lowest floor slab level of about RL 11.6 m AHD, with the potential for part of the basement to be deepened to about RL 11.1 m AHD. Based on the provided information we estimate a maximum retained height of about 3.5 m and up to 4.0 m if the basement is deepened.
- P3 (located under Buildings E, F and G – north-west part of the site): Lowest floor slab level of about RL 14.0 m AHD. Based on the provided information we estimate a maximum retained height of about 3.0 m to 6.0 m over the north-western and north-eastern parts of the site respectively.
- P4 (located under Building G and comprises a small section of the building footprint to the east of the P3 basement): Lowest floor slab level of about RL 17.1 m AHD. Based on provided information we estimate a maximum retained height up to about 3.0 m.

Whilst not specifically shown on the plans provided, localised deeper excavations for lift overruns / building core are expected to also be required.

Based on our experience we have assumed design maximum column working loads in the order of 3 MN to 5 MN for the development buildings. The design column loads should be confirmed by the project structural engineer.

3.0 PREVIOUS GEOTECHNICAL INVESTIGATION

Golder has been provided with a geotechnical investigation report for the site prepared by Intrax Pty Ltd (Intrax), dated 30 January 2017 (reference: 88797).

The geotechnical investigation completed by Intrax included eleven shallow augered boreholes (BH1 to BH11) drilled to nominal depth of 2 m to 3 m spread across the majority of the site and three augered boreholes in the south east of the site drilled to a depth of 9 m. No in situ testing or standard penetration test (SPT) samples were undertaken in boreholes in soils and no core samples were recovered from weathered rock. We consider that the findings of this Intrax investigation are of limited value given the nature of the proposed development (buildings between three and six above ground levels) and the nature of the design advice provided in the report.

4.0 AIMS OF THE SUPPLEMENTARY GEOTECHNICAL INVESTIGATION

The Department of Health and Human Services (DHHS) has advised that the main objective of the supplementary investigation is to provide additional geotechnical and environmental information to inform preliminary design and to reduce the potential exclusions and assumptions in costings to be developed by tenderers bidding for the design and construction Contracts for the proposed developments.

From a geotechnical perspective the objective is to characterise the ground conditions at the site and provide recommendations on footing options, retention systems, excavation conditions, groundwater management and earthquake risk. In order to provide the information required, we developed aims of the investigation as follows:

- Assess the subsurface conditions at the site relevant to the proposed development, including the presence and depth of fill, and depth to groundwater, if encountered.
- Provide recommendations on suitable footing systems for the proposed development including allowable bearing pressures for spread footings (if applicable) and design parameters for piled footings.

- Provide estimates of total and differential settlements for likely footing alternatives.
- Assess the site soil reactivity, characteristic surface movement and site classification in accordance with AS2870 – Residential Slabs and Footings.
- Provide recommendations on retention options for the basement and localised subsurface structures such as core and lift overruns including design earth pressures to be adopted in retaining wall design.
- Provide recommendations on groundwater management for both the temporary and permanent conditions.
- Comment on the likely excavation characteristics of materials over the depth of the proposed excavations.
- Provide advice for the excavation and stability of temporary and permanent batter slopes.
- Provide recommendations on subgrade preparation procedures for pavements and the lowest floor slab of the new buildings, including recommendations on the placement of engineered fill, if required and sub-surface drainage requirements.
- Assess a design subgrade California bearing ratio (CBR) value for use in pavement design (for areas surrounding the proposed new buildings).
- Evaluate the earthquake risk classification for the site in accordance with AS1170.4 (2007).

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

5.1 Field investigation

The field component of the investigation comprised the drilling of twelve boreholes (Boreholes GA20-BH-HAW-01 to GA20-BH-HAW-12) to depths of between about 14.2 m and 17.2 m and the excavation of ten test pits (GA20-TP-HAW-01 to GA20-TP-HAW-10) to depths of 0.8 m to 2.2 m. The locations of the Golder boreholes and test pits were measured by a Golder engineer using a Trimble differential GPS system (DGPS), accurate to 0.1 m, and are shown on Figure 1 and Figure 2. The ground surface elevation at the borehole locations range from RL 11.5 m AHD (GA20-BH-HAW-10) in the south west of the site to RL 19.8 m AHD (GA20-BH-HAW-03) in the north east of the site.

Prior to the drilling of boreholes Dial Before You Dig (DBYD) service plans were collated for the site. The site was then visited by an engineer from Golder and an underground service locator on 28 August 2020 to investigate the presence of underground services in the vicinity of each of the proposed test locations.

The investigation was undertaken between 31 August and 24 September 2020. The boreholes were advanced in fill and natural soils using solid flight auger and wash bore drilling techniques and NMLC sized diamond coring in weathered rock and some residual soils.

Standard penetration tests (SPTs) or undisturbed tube samples (U63) were undertaken at regular intervals in the boreholes in soils for sample recovery and visual and strength assessment and laboratory testing purposes. Continuous rock core samples were taken from the weathered rock for logging, strength assessment and laboratory testing. The test pits were excavated using an excavator and were undertaken primarily for environmental purposes, as such they are not referred to further in this report.

Groundwater monitoring wells were installed in Boreholes GA20-BH-HAW-01, GA20-BH-HAW-03, GA20-BH-HAW-05, GA20-BH-HAW-09, GA20-BH-HAW-10 and GA20-BH-HAW-12 on the completion of drilling. Following drilling and well installation, the wells were developed (water was removed to allow the inflow of

groundwater and hence reduce potential for water used during the drilling process to affect the measured groundwater level at the site).

A geotechnical engineer from Golder was present on site throughout the investigation and located the boreholes, described the subsurface conditions encountered, performed in situ testing, recovered samples of soil and rock and photographed the core samples recovered.

The results of the investigation are presented in Appendix A as Reports of Boreholes GA20-BH-HAW-01 to GA20-BH-HAW-12. Also presented in Appendix A are the following information sheets relevant to the interpretation of the reports of boreholes:

- Explanation of notes, abbreviations and terms used on borehole and test pit reports
- Method of soil description used on borehole and test pit reports
- Terms for rock material strength and weathering abbreviations for defect descriptions.

Photographs of the core samples recovered from the borehole are presented in Appendix B. Reports of groundwater well installations and the bore construction licences are presented in Appendix C.

In this report the term siltstone is used as a generic term for the weathered rock encountered during the investigation and includes both siltstone and sandstone. Refer to the Reports of Boreholes in Appendix A for differentiation between the two materials.

5.2 Laboratory testing

Laboratory testing was undertaken on representative samples of soil and rock to assist in classification of the materials encountered in the boreholes. The laboratory testing on soil samples comprised natural moisture content, Atterberg Limit, linear shrinkage, particle size distribution, permeability and shrink swell index tests.

Laboratory testing of rock samples comprised moisture content and strength testing (Uniaxial Compressive Strength (UCS) and point load strength index (PLSI)).

The results of laboratory testing is summarised and discussed in Section 6.4 of this report and the laboratory test reports are presented in Appendix D.

6.0 RESULTS OF THE INVESTIGATION

6.1 Geology

The Geological Survey of Victoria 1:63 360 ‘Ringwood’ mapsheet indicates that the site is underlain by Melbourne Formation but the mapped boundary between Melbourne Formation siltstone and Anderson Creek Formation siltstone is close to the site. A layer of fill is also expected from the ground surface and there is likely to be some residual soil overlying the siltstone.

Plate 1 shows the location of the proposed site development superimposed on the ‘Ringwood’ geological mapsheet.

Plate 1: Proposed site development (red) overlain on excerpt from 1:63:360 'Ringwood' geological mapsheet

6.2 Subsurface conditions

A description of the main subsurface units encountered during the geotechnical investigation is presented below and in Table 1. In this section and in Table 1 all depths quoted are below the ground surface level at the time of the investigation.

Site plans with the approximate locations of the boreholes and test pits (undertaken for contamination assessment purposes) are attached (refer Figure 1 and Figure 2). Figure 1 shows an aerial image with the investigation locations overlain and Figure 2 shows the proposed building development layout with investigation locations overlain.

In summary, a layer of surficial fill (Unit 1) was encountered across the site, extending to depths of between about 0.2 m and 4.0 m, underlain by residual siltstone (Unit 2a) grading to weathered siltstone rock (Unit 2b). In the east of the site (at Buildings A and G), relatively weak and deeply weathered, faulted brecciated siltstone to significant depth is present. Further details of these units are provided below.

Based on our visual and tactile assessments of the weathered siltstone we consider that the siltstone material is likely to be part of the Anderson Creek Formation rather than Melbourne Formation as indicated by the 'Ringwood' geological mapsheet in Plate 1.

Unit 1: Fill

Fill was encountered from the ground surface in all borehole locations. The fill thickness in boreholes ranged from 0.2 m (at GA20-BH-HAW-07) to 4.0 m (at GA20-BH-HAW-12). The fill materials generally comprised clay, gravelly and sandy clay, clayey sand. In some locations the fill materials had inclusions of glass, brick, wood, plastic and metal fragments. Given the composition of the fill we infer it to be uncontrolled.

Unit 2: Anderson Creek Formation (weathered siltstone)

In all boreholes the Unit 1 Fill was underlain by a layer of typically stiff or very stiff clay inferred to be residual siltstone (i.e derived from the complete weathering of the underlying rock) comprising clay, sandy and gravelly clay and clayey sand. The residual siltstone graded to weathered siltstone at depths of between about 2 m to 8 m below the existing ground surface level. There was a relatively deep siltstone weathering profile observed in a number of boreholes. The siltstone material in Boreholes GA20-BH-HAW-03, GA20-BH-HAW-06, GA20-BH-HAW-09 and GA20-BH-HAW-12 to the east of the site is inferred to be associated with a fault trending approximately north-south through the eastern part of the site. The siltstone material in Boreholes GA20-BH-HAW-03, GA20-BH-HAW-06, GA20-BH-HAW-09 and GA20-BH-HAW-12 encountered deeply weathered and broken rock, referred to commonly as breccia, which is the product of ancient faulting within the siltstone formation. The brecciated siltstone was predominantly encountered as angular clasts within a weathered clay / extremely weathered siltstone matrix.

In Boreholes to the west of the site, predominantly highly or less weathered siltstone was typically encountered at depths of 4 m to 8 m below the ground surface level.

Whilst not observed, it is common for weathered siltstone around Melbourne to be intruded with dyke material, particularly where faulted rock masses are present. Where encountered the dyke can often be of a weaker strength than the surrounding host rock, and the orientation, depth and lateral extent of dykes can vary considerably with depth and distance across a site. There is potential for dyke material to be present and to be encountered during piling works.

Table 1: Summary of depth ranges of subsurface units and sub-units (Boreholes GA20-BH-HAW-01 to HAW-12)

Description	Depth ranges of subsurface units and sub-units (m)					
	GA20-BH-HAW-01 RL 16.9 m AHD	GA20-BH-HAW-02 RL 17.3 m AHD	GA20-BH-HAW-03 RL 19.8 m AHD	GA20-BH-HAW-04 RL 14.2 m AHD	GA20-BH-HAW-05 RL 15.0 m AHD	GA20-BH-HAW-06 RL 17.0 m AHD
Unit 1 - Fill	0.0 – 1.0	0.0 – 0.3	0.0 – 0.4	0.0 – 1.0	0 – 1.5	0.0 – 0.3
Unit 2a – Residual Siltstone (clay, sandy and gravelly clay, clayey sand)	1.0 – 5.4	0.3 – 2.8	0.4 – 2.0	1.0 – 4.5	1.5 – 4.0	0.3 – 3.0
Unit 2b – Anderson Creek Formation (Siltstone)	5.4 – 14.6	2.8 – 14.9	2.0 – 15.5	4.5 – 15.4	4.0 – 15.5	3.0 – 13.6
XW or XW-HW Siltstone	-	*2.8 – 3.6*	*2.0 – 15.5**	*4.5 – 4.6*	*4.0 – 8.0**	*3.0-7.8*; 11.3-13.6**
HW or HW-MW Siltstone	*5.4–8.5; 10.0-12.6*	*3.6 – 7.0*	-	*4.6 – 6.5*	*8.0 – 15.5*	*7.8 – 11.3*
MW or less weathered Siltstone	*8.5-10.0; 12.6-14.6*	*7.0 – 14.9*	-	*6.5 – 15.4*	-	-
End Borehole	**14.6**	**14.9**	**15.5**	**15.4**	**15.5**	**13.6**

Description	Depth ranges of subsurface units and sub-units					
	GA20-BH-HAW-07 RL 12.4 m AHD	GA20-BH-HAW-08 RL 14.1 m AHD	GA20-BH-HAW-09 RL 16.0 m AHD	GA20-BH-HAW-10 RL 11.5 m AHD	GA20-BH-HAW-11 RL 12.5 m AHD	GA20-BH-HAW-12 RL 15.9 m AHD
Unit 1 - Fill	0.0 – 0.2	0.0 – 0.9	0.0 – 0.8	0.0 – 2.8	0.0 – 2.0	0.0 – 3.8
Unit 2a – Residual Siltstone (clay, sandy and gravelly clay, clayey sand)	0.2 – 4.3	0.9 – 3.8	0.8 – 7.0	2.8 – 6.0	-	3.8 – 8.0
Unit 2b – Anderson Creek Formation (Siltstone)	4.3 – 14.7	3.8 – 14.2	7.0 – 16.9	6.0 – 14.5	2.0 – 14.5	8.0 – 17.2
XW or XW-HW Siltstone	*4.3 – 5.4*	*3.8 –6.0*	*7.0 – 16.9**	*6.0 – 6.2*	*2.0 – 4.2*	*8.0-9.0*; 10.1-16.5**
HW or HW-MW Siltstone	*5.4 – 11.2*	*6.0 – 10.0*	*-*	*6.2 – 8.5*	*4.2 – 11.5*	*9.0-10.1; 16.5-17.2*
MW or less weathered Siltstone	*11.2 – 14.7*	*10.0 – 14.2*	*-*	*8.5 – 14.5*	*11.5 – 14.5*	*-*
End Borehole	**14.7**	**14.2**	**16.9**	**14.5**	**14.5**	**17.2**

Notes: The approximate surface elevation (m AHD) at the borehole locations was measured using a differential GPS (dGPS).
RL = reduced level, XW = extremely weathered, HW = highly weathered, MW = moderately weathered.
**brecciated siltstone, comprises predominantly highly fractured and sheared extremely to highly weathered siltstone with lenses of highly to moderately weathered rock.*

6.3 Groundwater

The depth to groundwater was measured at between about 4.3 m and 9.0 m below the current ground surface level in the standpipes installed as part of the investigation.

Groundwater monitoring wells were installed in Boreholes GA20-BH-HAW-01, GA20-BH-HAW-03, GA20-BH-HAW-05, GA20-BH-HAW-09, GA20-BH-HAW-10 and GA20-BH-HAW-12 on the completion of drilling. The wells were developed following installation to remove any remnant drilling fluid and to allow the groundwater to return to its equilibrium or standing level.

The depth to groundwater (as measured on 1 October 2020) and level of the groundwater measured in the boreholes were as follows:

- Borehole GA20-BH-HAW-01 – well installation to 10.0 m below ground surface level – depth to groundwater 9.0 m
  (RL 7.9 m AHD)
- Borehole GA20-BH-HAW-03 – well installation to 12.0 m below ground surface level – depth to groundwater 8.4 m
  (RL 11.4 m AHD)

- Borehole GA20-BH-HAW-05 – well installation to 10.0 m below ground surface level – depth to groundwater 8.2 m
  (RL 6.8 m AHD)
- Borehole GA20-BH-HAW-09 – well installation to 10.0 m below ground surface level – depth to groundwater 5.2 m
  (RL 10.8 m AHD)
- Borehole GA20-BH-HAW-10 – well installation to 10.0 m below ground surface level – depth to groundwater 5.1 m
  (RL 6.4 m AHD)
- Borehole GA20-BH-HAW-12 – well installation to 10.0 m below ground surface level – depth to groundwater 4.3 m
  (RL 11.6 m AHD)

Measured groundwater levels were relatively higher in boreholes in the east of the site at elevations ranging between RL 10.8 m AHD and RL 11.6 m AHD (in Boreholes GA20-BH-HAW-03, GA20-BH-HAW-09, GA20-BH-HAW-12) compared to groundwater levels measured in boreholes in the western part of the site at elevations ranging between RL 6.4 m AHD and 7.9 m AHD (in Boreholes GA20-BH-HAW-01, GA20-BH-HAW-05, GA20-BH-HAW-10).

Design groundwater levels for the site should take account of natural fluctuations of the groundwater level and the potential for localised rises in groundwater level, for example due to leaky water mains or drainage.

6.4 Laboratory testing

The laboratory testing comprised moisture content, Atterberg Limits, linear shrinkage and shrink swell index testing on recovered soil samples and moisture content, PLSI and UCS testing on representative samples of the weathered siltstone core. Samples of weathered siltstone were submerged in water following sampling for a minimum of 24 hours prior to testing.

Laboratory test reports are presented in Appendix D and the results of the laboratory testing are summarised in Table 2 and Table 3.

The results of the rock moisture content testing and UCS testing are plotted graphically against elevation in Figure 3 and Figure 4 respectively.

Table 2: Laboratory test results - soils

Borehole	Depth (m)	MC (%)	Atterberg Limits			Linear Shrinkage (%)	PSD			Shrink Swell Index (%)	Permeability (m/s)
			Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		% Fines	% Sand	% Gravel		
GA20-BH-HAW-01	2.9 – 3.3	13.8	32	14	18	7.5	-	-	-	-	-

Borehole	Depth (m)	MC (%)	Atterberg Limits			Linear Shrinkage (%)	PSD			Shrink Swell Index (%)	Permeability (m/s)
			Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		% Fines	% Sand	% Gravel		
GA20-BH-THW-04	1.5 – 1.9	24.5	41	15	26	11.5	-	-	-	2.8	-
GA20-BH-THW-05	2.5 – 3.0	18.2	52	19	33	10.0	-	-	-	-	-
GA20-BH-THW-06	1.5 - 2.0	23.1	55	22	33	10.5	-	-	-	-	-
GA20-BH-THW-07	1.5 – 1.9	18.8	50	16	34	7.5	-	-	-	2.2	-
GA20-BH-THW-12	4.0 – 4.4	13.9	17	13	4	2.5	58.2	41.6	0.3	-	$2x10^{-9}$

MC = moisture content; PSD = Particle size distribution (by sieve)

Table 3: Summary of laboratory test results - siltstone

Borehole	Sample depth^ (m)	Material description	Moisture content (%)	Point Load Strength Index $I_{S(50)}$ (MPa) - Diametral	UCS (MPa)
GA20-BH-HAW-01	5.8	Siltstone	6.8	-	-
	6.9	Siltstone	7.1	-	7.4
	8.4	Siltstone	11.3	-	-
	9.5	Siltstone	7.6	-	7.6
	10.8	Siltstone	8.5	-	-
	12.4	Siltstone	5.8	-	-
	13.1	Siltstone	8.4	-	3.5
	14.5	Siltstone	5.5	-	-
GA20-BH-HAW-02	3.9	Siltstone	9.8	-	-
	4.3	Siltstone	9.4	-	2.3
	5.9	Siltstone	9.6	-	-
	6.7	Siltstone	9.2	-	5.2
	7.3	Siltstone	8.5	-	-
	8.3	Siltstone	7.7	-	-
	10.4	Siltstone	7.4	-	11

Borehole	Sample depth^ (m)	Material description	Moisture content (%)	Point Load Strength Index $I_{S(50)}$ (MPa) - Diametral	UCS (MPa)
	11.3	Siltstone	7.6	-	-
	13.4	Siltstone	7.4	-	-
	14.7	Siltstone	6.9	-	-
GA20-BH-HAW-03	4.8	Siltstone	10.8	-	-
	5.4	Siltstone	8.9	0.15	-
	6.5	Siltstone	9.5	-	-
	8.0	Siltstone	11.2	0.05	-
	9.9	Siltstone	12.8	-	-
	10.9	Siltstone	14.9	-	-
	11.2	Siltstone	13.4	-	-
	12.8	Siltstone	13.6	-	-
	13.9	Siltstone	12.7	-	-
	14.2	Siltstone	11.4	-	-
	15.2	Siltstone	13.7	-	-
GA20-BH-HAW-04	4.7	Siltstone	10.6	-	-
	5.8	Siltstone	6.9	-	-
	6.1	Siltstone	5.9	-	7.8
	7.8	Siltstone	6.3	-	-
	8.7	Siltstone	6.3	-	-
	9.8	Siltstone	6.1	-	7.3
	11.9	Siltstone	6.7	-	-
	13.4	Siltstone	6.6	-	-
	15.3	Siltstone	6.2	-	-
GA20-BH-HAW-05	6.0	Siltstone	5.7	-	-
	7.1	Siltstone	4.4	-	-
	8.3	Siltstone	11.2	-	-
	9.9	Siltstone	11.1	0.09	-

Borehole	Sample depth^ (m)	Material description	Moisture content (%)	Point Load Strength Index $I_{S(50)}$ (MPa) - Diametral	UCS (MPa)
	10.3	Siltstone	12.2	0.07	-
	11.1	Siltstone	10.1	-	-
	12.1	Siltstone	9.4	-	-
	13.5	Siltstone	8.5	-	1.3*
	14.9	Siltstone	7.8	-	-
GA20-BH-HAW-06	6.8	Siltstone	11.1	0.14	-
	7.9	Siltstone	9.9	-	-
	8.1	Siltstone	10.1	0.42	-
	9.2	Siltstone	6.5	-	-
	10.4	Siltstone	8.0	-	1.6
	12.3	Siltstone	4.4	-	-
	13.3	Siltstone	5.0	-	-
GA20-BH-HAW-07	5.8	Siltstone	9.7	-	-
	6.7	Siltstone	9.7	-	3.7
	7.8	Siltstone	7.4	-	-
	8.1	Siltstone	8.5	-	4.3
	10.2	Siltstone	10.8	-	-
	11.3	Siltstone	7.2	-	-
	12.1	Siltstone	8.8	-	-
	13.2	Siltstone	4.2	-	-
	14.6	Siltstone	4.5	-	-
GA20-BH-HAW-08	7.3	Siltstone	7.3	-	3.1
	9.2	Siltstone	6.8	-	-
	10.2	Siltstone	6.3	-	8.3
	11.8	Siltstone	5.7	-	-
	13.1	Siltstone	6.8	-	5.8
GA20-BH-HAW-09	11.9	Siltstone	5.3	-	-

Borehole	Sample depth^ (m)	Material description	Moisture content (%)	Point Load Strength Index $I_{S(50)}$ (MPa) - Diametral	UCS (MPa)
	12.2	Siltstone	8.0	-	-
	13.1	Siltstone	5.5	-	-
	15.8	Siltstone	8.8	-	-
GA20-BH-HAW-10	6.4	Siltstone	8.1	-	6.1
	7.8	Siltstone	7.8	-	-
	9.1	Siltstone	7.3	-	-
	11.8	Siltstone	7.5	-	-
	12.3	Siltstone	7.4	-	4.0
	13.9	Siltstone	6.6	-	-
GA20-BH-HAW-11	3.1	Siltstone	8.8	0.5	-
	4.2	Siltstone	10.0	-	-
	5.9	Siltstone	11.7	-	-
	6.7	Siltstone	20.6	-	-
	7.3	Siltstone	10.2	-	3.9
	8.1	Siltstone	9.6	-	-
	10.0	Siltstone	12.9	-	-
	11.9	Siltstone	8.8	-	-
	13.6	Siltstone	7.2	-	-
GA20-BH-HAW-12	8.2	Siltstone	7.1	-	-
	9.7	Siltstone	3.5	0.27	-
	10.3	Siltstone	6.9	-	-
	12.8	Siltstone	8.5	-	-
	13.9	Siltstone	9.1	-	-
	14.9	Siltstone	10.5	0.25	-
	17.0	Siltstone	8.4	0.23	-

^Sample depth refers to approximate depth of midpoint of the sample tested rounded to one decimal place.
**Failure along pre-existing plane of weakness*

The results of UCS testing completed as part of the geotechnical investigation range from 1.3 MPa to 11 MPa with an average of 5.2 MPa (18 samples total), and results of point load strength index tests ($I_{s(50)}$) range from 0.05 MPa to 0.5 MPa with an average of 0.2 MPa (10 samples total).

The laboratory tests are generally consistent with our visual and tactile assessment of the rock strength typically ranging from very low to medium strength in the west of the site and very low to low strength in the east of the site.

The results of rock moisture content tests are often used as a classification test for weathered siltstone in Melbourne and there are published correlations between moisture content and strength and moisture content and modulus. Higher moisture contents are generally correlated to more weathered and weaker siltstone and lower moisture contents are generally correlated to less weathered and stronger siltstone. Figure 3 shows that siltstone moisture contents have some scatter in boreholes drilled in the west of the site but there is a general trend of decreasing moisture content with increase in depth in boreholes, while boreholes drilled on the east of the site show significant scatter in moisture contents with depth, which is likely to be attributed to faulted/brecciated siltstone encountered on the eastern side of the site.

6.5 Soil Reactivity

AS 2870-2011 provides guidance for the design of residential slabs and footing with respect to reactive soil ground movement associated with seasonal moisture change of the founding soils.

The type of proposed building development does not strictly conform to the requirements for standard footing designs described by AS 2870-2011 (section 3.1.1) and therefore this section is given as a guide only with respect to potential seasonal ground surface movement (y_s) range. Structures at this site should be designed based on engineering principals, taking into consideration soil reactivity considerations and the sub-surface (founding) conditions at the site.

Based on the results of laboratory testing we consider the Unit 2a soils are typically moderately to highly reactive, with shrink swell index results ranging from 2.2% to 2.8% (average 2.5%), liquid limit test results ranging from 17% to 55% (average 41%), and linear shrinkage test results ranging from 2.5% to 11.5% (average 8.3%), we estimate the potential shrink / swell movement of a footing founding at a depth of at least 1 m could be up to about 15 mm.

As a guide to possible reactive soil movement contribution for slabs on ground, we consider the existing natural (Unit 2a) clay to be highly reactive with respect to seasonal surface movement. This would correlate to a characteristic surface movement range of up to about 60 mm based on a site classification of H1 using AS 2870-2011.

For deep piled footing systems reactive soil movements can generally be ignored.

6.6 Preliminary drained geotechnical parameters

Table 4 provides preliminary drained geotechnical parameters. Caution should be used in adopting generic parameters for design. There are risks associated with misinterpreting a single set of parameters or the parameters being used for circumstances or design cases for which they were not intended. The parameters required for a soil-structure interaction analysis will depend on the method of analysis and constitutive soil model adopted by the designer (i.e. different parameters for the soil would apply depending on the type of modelling adopted).

Table 4: Preliminary drained geotechnical parameters

Unit	c' (kPa)	ϕ' (kPa)	E' (MPa)
Unit 1 - Fill	NA	NA	NA
Unit 2a – Residual Clay	5	25	30
Unit 2b – Anderson Creek Formation (Siltstone) XW or less weathered	50	30	100

Notes: c' = Effective cohesion; ϕ' = Effective Friction Angle; E' = Drained Young's Modulus; XW = extremely weathered; HW = highly weathered; NA = not applicable

7.0 FOOTINGS RECOMMENDATIONS

7.1 General

The results of the investigation indicate variable founding conditions across the development site. Across the south of the site relatively deep uncontrolled fill is present and we consider the fill is not a suitable founding stratum for footings. Over the eastern part of the site (comprising Buildings A and G), relatively weak and deeply weathered, faulted brecciated siltstone to significant depth is present.

A summary of expected founding conditions at the lowest floor slab level for each building and recommended footing options are as follows:

- **Building A / P1 basement (lowest floor slab RL 14.1 m AHD):** Based on boreholes drilled across this part of the site we expect founding conditions beneath the lowest basement floor slab to comprise either Unit 1 fill or Unit 2a residual clay. We expect the depth to the Unit 2b weathered siltstone to be greater than about 2 m below the underside of the lowest floor slab level and comprise predominantly brecciated siltstone associated with the fault over the eastern part of the site. We consider that piled footings would be required for this building other than for relatively lightly loaded columns (say working loads less than 1 MN) founding in the Unit 2a residual clay.
- **Buildings B and C / P2 basement (lowest floor slab RL 11.6 m AHD).** Based on boreholes drilled across this part of the site we expect founding conditions to comprise either Unit 1 fill or Unit 2a residual clay, with predominantly non-brecciated weathered siltstone at depth. The depth to weathered siltstone is expected to be greater than about 1 m below the underside of the lowest floor slab and we consider that that piled footings would be required for this building other than for relatively lightly loaded columns (say working loads less than 1 MN) founding in the Unit 2a residual clay.
- **Buildings E and F / western part of P3 basement (lowest floor slab RL 14.0 m AHD).** Based on boreholes drilled across this part of the site we expect founding conditions to comprise a combination of Unit 1 fill (where the proposed basement floor slab is close to the existing surface level), Unit 2a residual clay and potentially some minor areas of weathered siltstone. Three of the four boreholes drilled across this part of the site indicate weathered siltstone is likely to be encountered greater than 2 m below the underside of the lowest floor slab and at this concept stage we recommend that piled footings are adopted for this building, other than for relatively lightly loaded columns (say working loads less than 1 MN) founding in the Unit 2a residual clay.

- **Building G / P4 basement (lowest floor slab RL 17.1 m AHD) and eastern part of P3 basement (lowest floor slab RL 14.0 m AHD).** Based on boreholes drilled across this part of the site we expect founding conditions at P4 basement level to comprise either Unit 1 fill or Unit 2a residual clay and at P3 basement level either Unit 2a residual clay (western part of the footprint) or Unit 2b weathered siltstone (eastern part of the footprint). We expect the weathered siltstone to comprise predominantly brecciated siltstone associated with the fault over the eastern part of the greater site.

  Whilst shallow pad footings founding in the weathered siltstone could be adopted over the eastern part of Building G, it is difficult to accurately delineate the extent of the area that pad footings could be adopted given the relatively deep weathering zone encountered in the weathered siltstone and potential to encounter Unit 2a residual clay over the western part of the building footprint. Given this, we recommend that piled footings are adopted for this building, other than for relatively lightly loaded columns (say working loads less than 1 MN) founding in the Unit 2a residual clay.

The Anderson Creek Formation material is expected to be a suitable founding material for piles supporting the proposed development. The engineering properties of the siltstone are dependent on the degree and process of the weathering, with strength and stiffness typically increasing with depth as the degree of weathering decreases. Where the fault is present, we expect relatively weak, fractured siltstone to be present to depth. Suitable piling options at this site could include bored piles or continuous flight auger (CFA) piles (provided that a minimum pile length below the lowest basement founding level can be installed). Bored piles have the advantage of being able to be reinforced over their full depth, the design can be altered based on the ground conditions encountered and there is less potential for structural issues with the piles based on construction methodology.

If dyke or dyke affected materials of significantly lower strength than the host rock (siltstone or sandstone) are encountered in pile sockets it will be necessary for pile sockets to be lengthened or otherwise redesigned. For CFA piles it is impractical to observe the socket materials until the auger is withdrawn, and it is important that where there is a risk of encountering dyke materials, CFA piles are drilled to refusal of the auger (which is unlikely to occur if the tip of the auger is within weathered dyke materials), rather than to pre-determined target depths. Dyke materials stronger than the host rock could also be encountered at this site which may limit the socket length able to be achieved by CFA piles before refusal of the auger occurs.

If CFA piles are adopted, we recommend that the pile is drilled to a depth such that the length of pile from cut-off level is at least 6D (where D is the pile diameter) so that the footing acts as a pile. Where this requirement cannot be achieved with a CFA pile it may be necessary to construct a bored pile that is socketed into the weathered siltstone. The following sections of the report provide further comments and recommendations with respect to the design and construction of bored and CFA piles.

As noted above, it may be possible to support less heavily loaded elements on shallow spread footings founding below the fill within the Unit 2a residual clay or underlying weathered siltstone. However, care would be required if it is proposed to use a mix of spread footings and piles as significant differential settlements could occur between the different footing types.

Piles could either be installed from the ground surface prior to levelling and basement excavation works or post levelling and excavation work. The following should be considered in assessing the staging of the piling works:

- The costs associated with any pile length that will be removed during or following excavation.
- Access restrictions for piling plant.
- The requirement to construct a satisfactory working platform for the piling plant.

The following sections of the report provides further comments and recommendations with respect to the design and construction of CFA and bored piles and spread footings.

7.2 Piles

7.2.1 Design of Piles

The design of piled footings to resist applied loads should be in accordance with the Australian Standard for Piling - Design and installation (AS2159 - 2009). AS 2159 – 2009 requires a pile to be proportioned such that the design geotechnical strength ($R_{d,g}$) is not less than the design action effect (E_d). The design geotechnical strength is calculated as the design ultimate geotechnical strength ($R_{d,ug}$) multiplied by a geotechnical strength reduction factor (ϕ_g).

The value of the geotechnical strength reduction factor is influenced by the following factors,

- ϕ_{gb} – basic geotechnical strength reduction factor, which is in turn influenced by an assessment of various risk factors relating to the site, design methodology and the method of pile installation.
- ϕ_{tf} – intrinsic test factor based on the type of pile testing to be undertaken.
- K – testing benefit factor dependent on the percentage of piles to be tested.

The assessment of individual risk ratings for risk factors as set out in Table 4.3.2 (A) of AS 2159 - 2009 will need to be undertaken by the designer of the piled footings. However, to assist in a preliminary assessment of piled footings for documentation purposes we have made an assessment of the average risk rating based on the following factors and assumptions:

- The level and quality of the geotechnical investigation undertaken to date including laboratory testing of the weathered siltstone.
- The variability in ground conditions, in particular the presence of relatively deep fault zones encountered across the eastern part of the site.
- Our experience in the design of CFA and bored piles founding in weathered siltstone. CFA piles will be up to 1050 mm in diameter (given the limited experience with 1200 mm diameter CFA piles we consider a higher risk rating may apply).
- A competent and experienced piling contractor installs the piles.
- The bored pile footing scheme is low redundancy with predominantly either a single pile or two pile group beneath each column. We also consider a CFA scheme with clusters of piles beneath a column should be treated as low redundancy. In the situation where an unknown geological feature, such as a dyke, is present beneath the base of a pile within a cluster of piles we consider the cluster would behave in a similar manner to a larger individual pile. Hence, if clusters of CFA piles are documented they should be regarded as a low redundancy system.

Based on our assessment of the above factors and the assumptions listed we have assessed the average risk rating for the design of the piles to be between 2.5 and 3.0 for CFA and bored piles socketed into the weathered siltstone. In Table 4.3.2 (C) of AS 2159 – 2009 an average risk rating of between 2.5 to 3.0 is defined as low to moderate risk. The resultant basic geotechnical strength reduction factor for the assessed risk category is 0.52 for CFA and bored piles.

The piling code allows an increase in the basic geotechnical strength reduction factor depending on the type and extent of pile testing to be undertaken.

We have assessed that dynamic load testing of cast in situ piles (CFA piles founding in the weathered siltstone) can increase the basic geotechnical strength reduction factor by 0.06 for 1% of piles tested, 0.12 for 3% of piles tested and 0.16 for 5% of piles tested. The actual geotechnical strength reduction factor adopted will depend on the assessment of risk factors undertaken by the designer and the percentage of piles to be tested.

We note that it is generally not practical to undertake dynamic testing of bored piles and hence we consider the opportunity to improve the basic geotechnical strength reduction factor is limited to an increase associated with an increased level of observation during construction. Where a geotechnical engineer from Golder observes the drilling of all load bearing bored piles to confirm minimum socket requirements, we consider an increased geotechnical strength reduction factor of 0.60 could be adopted.

The actual geotechnical strength reduction factor adopted will depend on the assessment of risk factors by the designer and the percentage of piles to be tested or the level of observation and assessment during drilling of pile sockets.

Table 8.2.4b of AS 2159 provides guidance on the level of integrity testing for CFA piles. The standard indicates integrity testing of between 5% and 25% depending on certain design considerations and specifically whether the geotechnical or structural capacity governs. Given integrity testing is reasonably quick and is relatively low cost to undertake we recommend that at least 25% of the piles should be tested.

Golder personnel are experienced in undertaking both low strain integrity and high strain dynamic load testing of piles and would be pleased to assist building contractors with this testing, if requested.

7.2.2 CFA piles

The successful installation of CFA piles and their ability to achieve stated design loads relies on the nature and size of the equipment and procedures used in their installation. The recommendations presented in this report assume that piling contractors with satisfactory experience and equipment are engaged for the installation of the CFA piles.

The founding level of CFA piles will depend on the design column load, the pile diameter and the depth to the surface of the highly or less weathered siltstone.

The ground conditions encountered in the boreholes would suggest a suitable founding depth for foundation piles is likely to be within the highly or less weathered siltstone. Given the expected variable depth to the surface of the highly or less weathered siltstone, we recommend that CFA piles are drilled to effective refusal rather than to designated levels of penetration or toe levels. Based on the encountered ground conditions in boreholes the depth to effective refusal of CFA piles is likely to be greater on the eastern side of the site than the western side of the site. The design loads should be confirmed by dynamic load testing and subsequent CAPWAP analysis.

The assessment of the geotechnical design strength for CFA piles is highly dependent on the nature and depth of the founding material, the nature of the equipment used to install the piles and the methodology used to construct the piles. We consider that rather than assess a potential theoretical design value for such piles it is more appropriate to review test data with respect to the pile resistances that have been mobilised on similar piles founding in similar materials.

In assessing likely allowable geotechnical loads for CFA piles at the site, we have reviewed the results of dynamic load testing undertaken on CFA piles drilled to refusal with similar stratigraphic conditions. For preliminary design purposes we recommend the design geotechnical strength values presented in Table 5.

As previously noted, the design of piles is required to be in accordance with the Australian Standard Piling – Design and installation (AS 2159) and the designer of the piles will need to satisfy the criteria presented in the standard.

Table 5: Indicative typical axial working loads - CFA piles founding in Unit 2b weathered siltstone

CFA pile diameter	Previously demonstrated pile resistance*	Recommended maximum R_{dg} ^	Inferred equivalent working load#
600 mm	10 MN	5.6 MN	4.1 MN
750 mm	13 MN	7.3 MN	5.4 MN
900 mm	20 MN	11.2 MN	8.3 MN

** these are approximate / typical values not absolute maximum values*

^ these values are subject to confirmation by dynamic load testing and assessment of pile structural capacity

#-these values have been assessed based on an inferred load factor (Rdg / working load) of 1.35.

Please note that the above typical geotechnical strengths are presented as a guide only and we recommend that dynamic testing and CAPWAP analysis is undertaken on CFA piles at the site. Given that the installation of CFA piles is based on an installation methodology (drill to refusal) rather than a theoretical design (such as penetration into materials of a certain weathering and strength) testing to confirm the load settlement performance of CFA piles is a critical part of the design. We consider that between 3% and 5% of all CFA piles should be subject to dynamic load testing and subsequent CAPWAP analysis to confirm the adopted design. The potential for increased settlement beneath pile groups or clusters would need to be assessed once the piling layout is known.

Settlement at the pile head would be made up of elastic shortening of the pile, settlement of the pile length embedded in the weathered siltstone at the designated serviceability load. Settlement is expected to be up to about 1% of the pile diameter. For multiple piles beneath a column group effects would cause increased settlements. Group settlements can only be assessed after the final piling arrangement is known. The differential settlement between adjacent pile groups is estimated to be about half the settlement of a pile group.

As noted previously there may be some areas where the depth to where CFA piles terminates is insufficient for the footing to act as a pile. In these circumstances we recommend that the pile is drilled to a depth such that the length of pile from cut-off level is at least 6D (where D is the pile diameter). Where this requirement cannot be achieved with a CFA pile it may be necessary to construct a bored pile that is socketed into the weathered siltstone.

7.2.3 Bored piles

Bored piles socketed into the weathered siltstone would derive their geotechnical capacity from a combination of shaft and base resistance. Preliminary ultimate unit stresses for the design of axially loaded bored piles are presented in Table 6 for Buildings A and G to the east of the greater site where brecciated siltstone associated with the fault zone is present and in Table 7 for Buildings B, C, E and F to the west of the site where the siltstone encountered was typically more competent. The values presented in Table 6 and Table 7 are ultimate values and hence should be used to assess the ultimate design geotechnical strength ($R_{d.ug}$) of

the pile which is then required to be factored using the adopted geotechnical strength reduction factor (φ_g) for comparison with the design action effect for the pile (E_d).

Table 6: Indicative maximum ultimate unit stresses – bored piles eastern part of the greater site (Buildings A and G)

Material description	Ultimate shaft stress (kPa) for pile diameters <1 m	Ultimate base resistance (kPa)
Residual Clays	75 kPa	NA
XW / XW-HW siltstone (brecciated)	150 kPa	4000 kPa
HW and less weathered siltstone (brecciated)	250 kPa	8000 kPa

XW = extremely weathered, HW = highly weathered – comprises zones of more weathered material.

Table 7: Indicative maximum ultimate unit stresses – bored piles western part of the greater site (Buildings B, C, E and F)

Material description	Ultimate shaft stress (kPa) for pile diameters <1 m	Ultimate base resistance (kPa)
Residual Clays (very stiff or stiffer)	75 kPa	NA
XW-HW siltstone	200 kPa	4000 kPa
HW and less weathered siltstone	500 kPa	8000 kPa

XW = extremely weathered, HW = highly weathered.

It is critical to note that the assessment of bored pile socket lengths using Tables 5 and 6 needs to address the settlement of the pile under serviceability load conditions. This is considered by having a minimum of 60% to 65% of the design action effect for each individual pile taken in shaft resistance. The ultimate base stresses presented in Table 6 and Table 7 would allow the calculation of significantly shorter sockets if the ultimate design geotechnical strength was then multiplied by the strength reduction factor to assess the allowable design action effect. However, these base stresses are used to satisfy the ultimate geotechnical design strength of the piles and are only mobilised at displacements significantly greater than those taken as acceptable for normal building conditions.

Bored piles are drilled as an open hole with the pile reinforcement cage placed and concrete poured following completion of the pile socket. There is the potential for collapse of unsupported bored pile excavation and temporary support (e.g. casing or polymer) may be required to facilitate drilling, particularly within the brecciated siltstone.

If groundwater is encountered during the drilling of bored piles, we expect the rate of groundwater inflow from the weathered rock to be low and readily controlled during drilling and pile construction. If piles extend below the groundwater table then it will be necessary for piles to be poured using a tremie pipe. Tremie pouring of bored piles is good practice anyway to reduce the potential of segregation from concrete hitting the reinforcement cage.

Bored piles should be constructed in the full-time presence of a suitably qualified geotechnical engineer to confirm the subsurface conditions are consistent with those assumed in design. We recommend that the base of the pile is level and essentially free of loose or disturbed material. The sides of the socket should be roughened and cleaned of clay smear prior to casting of the pile.

A preliminary assessment of target toe levels for various sized bored piles are presented in Table 8 below. These pile toe levels have been calculated based on the assumed subsurface profiles below, and by adopting the ultimate unit stresses outlined in Table 6 (for Buildings A and G) and Table 7 (for Buildings B, C, E and F), and a basic geotechnical strength reduction factor of 0.52.

For the preliminary assessment of pile lengths, we have adopted the below sub-surface profiles. It is recommended that a geotechnical engineer observes the construction of piles to confirm socket requirements are met.

Ground profile for west of site (Buildings B, C, E and F)

- 0 to 2.0 m depth: (neglect for contributing to pile load capacity)
- 2.0 m to 4.0 m depth: Residual clay
- 4.0 m to 8.0 m depth: Extremely and extremely to highly weathered siltstone
- 8.0 m and below: Highly weathered siltstone.

Ground profile for east of site (Buildings A and G)

- 0 to 2.0 m depth: (neglect for contributing to pile load capacity)
- 2.0 to 4.0 m depth: Fill (neglect for contributing to pile load capacity)
- 4.0 m to 8.0 depth: Residual clay
- 8.0 m to 18.0 m depth: Extremely and extremely to highly weathered (brecciated) siltstone
- Below 18.0 m depth: highly or less weathered (brecciated) siltstone

Table 8: Target pile toe depth for bored piles

	West of Site: Buildings B, C, E and F		East of Site: Buildings A and G	
Bored pile diameter (mm)	**Design working load (kN)**	**Toe depth (m) – below basement level**	**Design working load (kN)**	**Toe depth (m) – below basement level***
600	3000	10.0	3000	19.0
600	5000	16.5	5000	NA
750	3000	8.0	3000	17.0
750	5000	13.5	5000	NA
900	3000	7.0	3000	14.5
900	5000	11.0	5000	21.0

	West of Site: Buildings B, C, E and F		East of Site: Buildings A and G	
Bored pile diameter (mm)	**Design working load (kN)**	**Toe depth (m) – below basement level**	**Design working load (kN)**	**Toe depth (m) – below basement level***
1200	3000	6.0	3000	10.0
1200	5000	7.5	5000	17.0

** We note that boreholes extended to maximum depth of about 17 m. Therefore, these are estimated pile lengths only. We recommend that if bored piles are to be used on the eastern side of the site that further investigation is undertaken to verify the ground conditions adopted for design.*

The top of socket settlement of an individual bored pile designed in accordance with the above recommendations is expected to be up to about 1% of the pile diameter.

The pile design parameters presented above assume appropriate construction practices are adhered to by the piling contractor. Should appropriate roughening and cleaning practices not be undertaken by the piling contractor then we consider that a reduction in the above pile design parameters would need to be adopted.

If a geotechnical engineer observes the construction of bored piles to confirm socket requirements are met, there is potential to reduce the pile lengths, as a realistic ground profile (rather than an assumed conservative ground profile) could be adopted and an increased strength reduction factor could apply.

7.2.4 Geotechnical construction issues for bored and CFA piles

Bored piles are drilled as an open hole with the pile reinforcement cage placed and concrete poured following completion of the pile socket. There is the potential for collapse of unsupported bored pile excavation and temporary support (e.g. casing) may be required. CFA piles are typically drilled to refusal in the weathered siltstone. The auger supports the hole during drilling to refusal and concrete is pumped into the void as the auger is extracted, so other temporary support for the pile excavation is not required. The construction methodology for CFA piles requires the steel reinforcing cage to be pushed into the wet concrete following extraction of the auger. This can limit the length over which the pile can be reinforced.

Even though dyke materials weren't encountered during the geotechnical investigation there is the potential to encounter these materials during the drilling of piles. The impact of weak dyke material on the pile length is governed by the angle and orientation of the dyke. If the dyke is near vertical the pile may need to extend a significant distance to penetrate through the dyke. Where the dyke material intersects the socket shaft of a pile at a relatively shallow angle it may have a lesser impact with that section of the socket (and potentially the material above the dyke) ignored in terms of geotechnical strength.

The depth to groundwater is expected to be about 4 m to 9 m below the current ground surface level. Depending on the pile diameter adopted there is potential for piles to extend below the groundwater table. We do not recommend dewatering of bored piles which may increase instability and consider it will be necessary for piles extending below the groundwater table to be poured using a tremie pipe. Tremie pouring of bored piles is good practice anyway to reduce the potential of segregation from concrete hitting the reinforcement cage.

7.2.5 Piling platform

Our experience with piling rigs is that the maximum pressure beneath the tracks during piling can be up to about 300 kPa. We recommend that an assessment of support conditions and the requirements for the placement of a platform is made prior to commencement of piling.

Piling platform requirements will depend on the imposed pressure beneath the tracks and the nature of the exposed subgrade materials.

If requested following appointment of a piling contractor and provision of the track loads, we can prepare a proposal to provide an assessment of the subgrade conditions post demolition and advice on procedures for the preparation and placement of a piling platform and the minimum thickness of any platform that may be required.

7.3 Spread footings

Shallow strip or pad footings founding within the natural stiff to very stiff clays Unit 2a residual clay could be a suitable footing option for lightly-loaded columns (say less than 1 MN working load). The Unit 1 fill is not considered a suitable founding stratum for shallow footings. We recommend that shallow spread footings founded in natural soil are founded with a minimum embedment of at least 1 m. This may require either over-excavation or the depth of embedment to be increased where significant thicknesses of fill is present.

We recommend that spread footings founding within natural residual clay of at least stiff consistency is proportioned based on a maximum allowable bearing pressure of 150 kPa for pad footings and 120 kPa for strip footings (up to a maximum footing dimension of about 2.6 m by 2.6 m for pads and 1.5 m width for strip footings).

The total movement of spread footings can be estimated by summation of the load induced settlement and shrink / swell movements. We estimate load induced settlement of a spread footing proportioned in accordance with the recommended bearing pressures on natural soil to be less than about 15 mm to 20 mm. The differential settlement between adjacent footings (similarly loaded and sized) is expected to be about half this value. However, for lightly loaded footings founded on reactive clay, additional vertical movement may occur due to seasonal moisture-induced volumetric changes.

Refer to AS2870 (2011) ‘Residential slabs and footings’ for guidance on maintenance requirements for shallow footings and floor slabs that should be adopted to reduce potential ground movements due to shrink swell behaviour of the natural clay soils (noting that given the size of the proposed development we consider the standard footing systems outlined in AS 2870 would not be applicable for this proposed development).

8.0 SITE RETENTION

We understand that there are single level and double level basements proposed across parts of the site. Due to the sloping ground the retained height of the basements is greatest over the northern side of the basements. We understand the maximum retained heights for basements are up to about 6 m in the north east of the site but that the majority of the site will have a retained height of 4 m or less. We also expect there to be localised deeper excavations required for lift overruns / building cores.

Based on the subsurface conditions encountered during the investigation we expect that the basement bulk excavation and any localised excavations will encounter fill (Unit 1) overlying stiff or stiffer clays (Unit 2a – Residual clay) and potentially weathered siltstone (Unit 2b).

The design and construction of a retention system is dependent on the nature of the materials to be retained, the sequence of construction, the nature and extent of adjacent structures and footings, the allowable lateral ground movements and associated settlements behind the wall, groundwater conditions and the magnitude of any vertical loads to be supported by the wall.

Based on the subsurface materials encountered and our experience with similar developments, we consider a cantilevered or anchored soldier pile wall with shotcrete infill panels is likely to be the preferred method of retention for the development.

Soldier piles could be installed using CFA or bored pile techniques, with basement excavation and the progressive installation of shotcrete panels (with drainage if a drained basement is adopted) undertaken in stages. Cantilevered soldier piles will require deeper embedment below the proposed excavation level than anchored piles.

In the temporary condition, soldier piles could potentially be cantilevered (for wall heights less than say 3.5 m) or anchored depending on the method of construction and requirements to limit lateral and vertical ground movement behind the walls. In the permanent condition, we assume that the retaining walls would be supported by internal floor slabs (i.e. internal basement or ground floor slabs will provide props in the permanent condition). Following construction of the building any temporary ground anchors would be de-stressed or props removed.

Alternatively, where space permits, temporary batter slopes with construction of a precast wall and subsequent backfilling behind the retaining wall could also be adopted for basements excavations up to about 3 m depth.

The following sections provide guidance on design earth pressures for retention structures that could be constructed using different methods or techniques.

8.1 Retaining wall design pressures

8.1.1 Anchored or propped retaining walls

For preliminary design of retaining walls that are propped or anchored in the temporary and permanent condition we recommend wall pressures dependent on the zone of influence of the proposed excavation as follows:

- The zone of influence is taken as a zone lying above a plane, sloping at 40 degrees above the horizontal, from the base of the excavation.
- Where adjacent buildings and or movement sensitive services are not within the zone of influence, the lateral earth pressure is a uniform pressure of 4H kPa, where H is the total height of the wall in metres.
- Where adjacent buildings and/or movement sensitive services exist within the zone of influence, a uniform pressure of 6H kPa should be adopted, where H is the total height of the wall in metres.
- The effect of surcharge pressures (including surcharge loads from compaction equipment where relevant, for example if the retaining wall is required to support backfill) should be added to the lateral earth pressures. Where adjacent building footings or movement sensitive services are not within the zone of influence, an earth pressure coefficient of 0.4 should be adopted. Where adjacent building footings and/or movement sensitive services are within the zone of influence, an earth pressure coefficient of 0.6 should be adopted.

The above recommendations assume positive drainage will be provided behind the retaining walls. This may be provided as a series of strip drains placed behind the shotcrete infill panels. If drainage is not provided the retaining wall design would need to allow for a potential build-up of hydrostatic pressures following periods of heavy rain etc. Water intercepted by this drainage may be collected by a perimeter sub floor drainage system that drains to a sump for off-site disposal.

The main retaining elements (e.g. anchored or propped soldier piles) should be designed for the pressures recommended above. Where infill panels are used in conjunction with soldier piles they may be designed for a lower pressure to take advantage of pressure reduction due to arching of the ground between the individual soldier piles. It is recommended that the infill panels be designed for half the previously recommended pressures.

Ground anchors

We anticipate that a soldier pile wall may be supported during excavation by temporary ground anchors. Following construction of the floor slabs, the ground anchors would be de-stressed as the floors will provide lateral support in the permanent condition.

Installation of ground anchors should be on a design and construct basis, with contractors required to achieve the stated loads via proving tests. To reduce lateral displacement of the supported wall the anchors should be installed at a shallow depth as soon as is practical with excavation to proceed no further than say 0.5 m below the level of the anchor prior to anchor installation and anchor stressing.

For the purposes of preliminary sizing of ground anchors, assuming the ground anchors are installed using air flush drilling techniques, we recommend a maximum allowable soil to grout bond stress of 50 kPa for the Unit 2a and 100 kPa for the Unit 2b materials in the west of the site and 75 kPa for Unit 2b materials in the east of the site (comprising Buildings A and G).

We recommend that the fixed length of anchors be no less than 3 m and no greater than 9 m and should start a minimum of 1 m beyond a 45º line drawn up from the base of the wall. Although extensive sandy soils are not anticipated on this site, anchor holes drilled in the sandy soils below the water table could potentially be unstable during drilling, anchor installation and grouting. Collapse of anchor holes may result in subsidence of ground surrounding the basement excavation. Casing may be required to maintain an open hole during anchor installation.

For traditional post tensioned anchors we consider the anchors should be secondary grouted. That is, grouting the full length of the anchor with only sheathing used over the free length to be an unsatisfactory installation methodology. We recommend that the fixed length is grouted prior to post tensioning with the designated free length maintained free of grout until after the anchor is post tensioned.

We recommend that testing of anchors is in accordance with AS 4678 – Earth-retaining structures which requires temporary anchors to be proof loaded to 125% of the design working load and held for a period of 15 minutes. We also recommend a geotechnical engineer from Golder observes the installation and testing of a trial anchor to confirm anchor performance prior to installation of production anchors.

8.1.2 Cantilever retaining walls

Depending on the proposed depth of excavation and the lateral displacements that can be tolerated behind the wall it may be possible to construct a wall that is not anchored or propped in the temporary condition and hence is a cantilever wall. For example, where the depth of the excavation is relatively small a soldier pile wall with infill panels and no propping could be designed based on the following design pressures:

A triangular pressure distribution increasing with depth from zero at the ground surface, at the rate of Kγ/m. We recommend a coefficient of earth pressure K=0.4 where movement sensitive services / structures are not within the zone of influence of the excavation and 0.6 where they are. The recommended unit weight (γ) to be adopted for the fill and natural soils above the groundwater table is 20 kN/m^3.

The effects of surcharge pressures also need to be added in accordance with Section 8.1.1. The above recommendations assume positive drainage will be provided behind the retaining walls. If drainage is not provided the retaining wall design would need to allow for the build-up of hydrostatic pressures following periods of heavy rainfall.

8.1.3 Soldier pile spacing

The spacing of soldier piles is likely to be governed by the potential for loss of material between piles, based on our experience with soldier pile walls in fill over residual clays we consider a centre to centre spacing of about 3D, where D is the diameter of the soldier piles (i.e. for 600 mm diameter piles a maximum centre to centre spacing of 1.8 m to be adopted). Some loss of material from the upper fill and soil should be expected from between the piles. We recommend that the first excavation lift be limited to a depth of about 1.5 m (measured below the top of the capping beam) before installing the first row of anchors and supporting infill panels.

The depth of embedment of the soldier piles below basement bulk excavation level for toe stability is dependent on the strength of the materials encountered below the excavation level.

8.1.4 Retaining walls constructed using temporary batter slopes

If sufficient space is available, excavations can be undertaken using temporary batter slopes with subsequent backfilling behind the retaining wall, (single level basement only, maximum 3 m depth). Refer to a later section for recommendations on maximum temporary batter slopes.

For retaining walls constructed using this method we recommend the following wall design pressures are adopted:

- A minimum of 15 kPa (due to compaction induced lateral pressures) or a triangular pressure distribution increasing with depth from zero at the ground surface at the rate of Kγ/m. We recommend a coefficient of earth pressure of K = 0.4 over the height of the wall.
- The recommended unit weight (γ) to be adopted for the fill and near surface material above the groundwater table is 20 kN/m^3.

The above recommendations assume positive drainage will be provided behind the retaining walls. If drainage is not provided the retaining wall design would need to allow for the build-up of hydrostatic pressures following periods of heavy rainfall.

The compaction of the backfill material behind the wall is important in reducing settlement beneath adjacent ground slabs supported directly by the finished ground surface. We recommend that the select backfill be compacted to achieve a minimum density ratio of 98% Standard in accordance with AS 1289.5.1.1 and AS 1289.5.4.1 However, to avoid excessive compaction pressures on the wall we recommend that the size of the compaction equipment used should be limited. In areas where there is insufficient room to operate compaction equipment behind the wall we recommend the use of cement stabilised sand as a backfill material up until a level where there is sufficient space to operate compactive equipment.

The effects of surcharge pressures also need to be added in accordance with Section 8.1.1.

8.1.5 Building core and lift overrun pits

Due to the expected plan area of the building cores and lift overrun pits we anticipate these will likely be excavated by either benching or battering, provided there is sufficient space on site. If these excavations are benched/battered (see Section 8.4) there will be no requirement for temporary retaining walls.

8.2 Groundwater management

As discussed in Section 6.3, the measured groundwater levels in boreholes were relatively higher int the east of the site at elevations ranging between RL 10.8 m AHD and RL 11.6 m AHD (in Boreholes GA20-BH-HAW-03, GA20-BH-HAW-09, GA20-BH-HAW-12) compared to groundwater levels measured in boreholes in the western part of the site at elevations ranging between RL 6.4 m AHD and 7.9 m AHD (in Boreholes GA20-BH-HAW-01, GA20-BH-HAW-05, GA20-BH-HAW-10).

The proposed top of basement floor slab levels in the east of the site are provided below:

- P1 basement slab RL 14.1 m AHD but we understand the P1 basement slab level could be lowered to about RL 12.6 m AHD in the northern section of the basement and be connected to lower level of the P2 basement.
- P2 lowest basement slab RL 11.6 m AHD with potential for this to be lowered to RL 11.1 m AHD if connected to P1 basement
- P3 basement slab RL 14.0 m AHD
- P4 basement slab RL 17.1 m AHD.

Based on the measured groundwater level in standpipes, the P1 basement bulk excavation and the eastern side of P2 basement excavation may extend close to the groundwater level on the eastern side of the site. The eastern side of the P3 basement excavation is about 2.4 m above the groundwater level measured in the eastern boreholes. Locally deeper excavations for lift overrun pits and temporary excavations for spread footings or pile caps may extend below the groundwater in the eastern side of the site.

We recommend the construction of a continuous drainage layer beneath the lowest basement floor slabs for basements P1, P2 and P3 so that if groundwater if encountered can be intercepted and directed to a sump and pumped out to prevent a buildup of hydrostatic pressure that could damage the floor slab. We do not consider a permanent drainage layer beneath the P4 basement slab is necessary.

We recommend that all lift overrun pits or similar structures that locally extend below the basement floor slabs or below the lowest building floor slabs in other areas where it would not be practical to construct and maintain subfloor drainage be designed and constructed as a tanked/sealed (designed to prevent groundwater inflow and designed to withstand hydrostatic pressure).

The construction of drained basements requires a robust drainage system that is capable of functioning over the life of the development. The drainage layer typically comprises open-graded crushed rock placed over and covered by a geotextile separation layer. Retaining wall drainage can be connected into the drainage layer so that retaining wall and subfloor drainage is directed into a sump for pumping and onsite treatment and reuse or offsite disposal. Whilst constructing the drainage layer, particular care should be taken to ensure the geotextile is not damaged by the rock backfill which in turn is not contaminated with soil or other materials.

We recommend that the geotextile used be a non-woven needle punched geotextile with an O95 (95% of openings less than) value of 120 microns or less. The robustness of a geotextile is measured by its 'G' rating in accordance with Austroads guidelines. We suggest it may be prudent to adopt a robust geotextile with a 'G' rating of at least 2000 to reduce the potential for damage to the geotextile during construction. Maintaining the integrity of the fabric is critical to the long-term performance of the drainage system. Damage of the geotextile during placement and trafficking of a rock layer must be avoided and any damaged areas repaired.

Given the proposed basement floor slab is above the groundwater level as measured during the investigation it is not practical for us to comment on the rate of inflow that could occur if the groundwater level rises in the future. Some allowance should be made for the collection of water from behind the retaining walls and potential rises in groundwater level that could occur for a variety of reasons including climatic conditions, leaking services etc. Given temporary footing or pile cap excavations are unlikely to extend more than about 1 m below the groundwater level (if at all) we expect temporary groundwater inflow could be managed by pumping from a temporary sump.

The disposal of groundwater during either temporary dewatering or in the permanent condition will require an agreement with the relevant authority to allow the groundwater to be pumped to sewer under a trade waste agreement (generally separated into construction and post construction) or to stormwater with approval from the relevant council authority.

Requirements for the offsite disposal of collected water will need to be confirmed with the relevant regulatory authorities.

8.3 Excavation characteristics

We expect excavations will be required for the basements, lift overrun pits, building cores etc. extending about 2 m below the lowest basement floor slab levels (i.e. in basement areas up to about 8 m depth). Excavations to this depth are expected to encounter Unit 1 fill material overlying stiff to very stiff Unit 2a residual clays and Unit 2b extremely or extremely to highly weathered siltstone or sandstone. We expect the majority of the excavation should be able to be undertaken using conventional excavation equipment (i.e. medium to large excavators). We note that remnant old concrete slabs and footings are likely to require the use of a hydraulic breaker to facilitate their removal.

8.4 Temporary and permanent batter slopes

We recommend that the maximum slopes for any unsupported temporary batters, not exceeding 3 m in total height, should be 1.5H:1V in Unit 1 fill, Unit 2a residual clays and Unit 2b extremely or extremely to highly weathered siltstone or sandstone. If site restrictions require temporary batters to be steepened beyond these recommended slopes, we recommend that ground support systems be implemented before proceeding with any excavation works.

We recommend for permanent batters:

i) Maximum slopes not exceeding 3 m in total height be 2H:1V in the Unit 1 fill and Unit 2a residual natural clays and Unit 2b weathered siltstone or sandstone.

ii) A stability check is performed on all proposed temporary and permanent unsupported batters exceeding 3 m in total height.

iii) Drainage control is provided at the top of all batters, to prevent water ponding behind the crest and infiltration of ponded water, which would affect the stability of the batter slopes.

At these recommended slopes, loss of material should be expected from unsupported batter faces in soils due to fretting as a result of wetting and drying. To prevent this, shotcrete could be sprayed on the batter face with evenly spaced drainage weep holes across the face.

In areas adjacent to existing buildings, flatter batters would be required. If temporary batters are proposed in these areas, further advice should be sought prior to any construction works.

8.5 Reuse of excavated materials

We are unaware of any specific requirement to reuse excavated materials as engineered fill at the site. The following comments are provided as general guidance regarding the potential to reuse the excavated materials.

We consider that any topsoil or existing fill materials (Unit 1) are unsuitable for reuse as engineered fill.

Based on the laboratory testing results, the residual clay material (Unit 2a) was generally a medium to high plasticity clay. High plasticity clays can lead to difficulties during earthworks including difficulties in achieving a uniform moisture content, poor workability during wet weather, inability to meet stringent proof-roll criteria and potential loss of strength after placement if subjected to moisture ingress. However, with careful work practices, these materials could potentially be reused as engineered fill. Stabilisation (e.g. by adding lime) of the high plasticity clay could also be considered if they are to be used as select fill materials (i.e. low reactivity fill).

Engineered fill should meet the following criterion:

- (Plasticity Index) x % passing 0.425 mm sieve (AS sieve) to be less than 1000

Based on the laboratory testing results the plasticity index of the Unit 2a materials ranged from about 4% to 34% at depths ranging between 1.5 m to 4.4 m. The average plasticity index of these values is about 25% which would require a maximum of about 40% material passing the 0.425 mm sieve to satisfy the above criteria. Therefore, the Unit 2a residual soil material, assessed to be clay would require some treatment (i.e. mixing, stabilisation, etc.) before it can be reused as engineered fill.

If requested, we would be pleased to provide further advice if reuse of Unit 2a soils as engineered fill is proposed.

8.6 Subgrade preparation procedures

The exposed subgrade at the proposed built excavation levels is expected to consist of either Unit 1 fill or Unit 2a residual clays for areas without a basement and Unit 1 fill, Unit 2a residual clays or Unit 2b weathered siltstone at the bulk excavation level of the basements. Based on the results of the investigation and the laboratory testing we recommend that where slabs on ground are considered that they should be founded either on or within the natural soils. It is not suitable for footings or slabs on ground to be founded on the existing fill. If slabs on ground are proposed to be founded in areas where existing fill is present, we recommend that the fill is removed to natural surface level, replaced with select engineered fill, and compacted in accordance with the recommendations presented below. Alternatively, a suspended slab option could be adopted in these areas.

We recommend the following general procedures are adopted for subgrade preparation:

- Excavate to the design subgrade level.

- Compact the exposed subgrade and inspect for fill or soft, loose, weak or unstable areas.
- Removed any fill, soft, loose, weak or unstable areas and replace with suitable select fill.
- Any select fill used should be relatively stable to volume change with changes in moisture content.

  Suitable imported material types are expected to include predominantly granular materials such as crushed scoria, non-descript crushed rock, weathered siltstone or sandstone or clayey sand. The select fill should be well graded with a maximum particle size after compaction of 50 mm. The select imported fill should meet the following criterion:

  (Plasticity Index) x % passing 0.425 mm sieve (AS sieve) to be less than 1000
- All fill should be placed in uniform horizontal layers not exceeding 200 mm loose thickness and each layer compacted to achieve a minimum density ratio of 98% Standard in accordance with AS 1289.5.4.1. The moisture content of the minus 19 mm fraction should be within 3% of the standard optimum moisture content (AS 1289.5.1.1).

We recommend that subgrade preparation, fill placement and compaction be undertaken in accordance with AS3798, 'Guidelines on earthworks for commercial and residential development'. Any field density testing should be performed in accordance with the test methods specified in AS1289.

If conditions vary significantly during construction and there is difficulty in achieving a suitable base prior to placement of the ground floor basement slab additional advice should be sought.

The long term performance of slab on ground floors built over a clay subgrade is dependent on the subgrade moisture condition at both the time of construction and in the years following construction. If very wet conditions are prevalent at the time of construction then there is the risk of subsequent shrinkage occurring as the clay dries out. Alternatively, if very dry conditions have prevailed for a significant period of time prior to construction there is the potential for heave as the clays absorb moisture after construction of the slab. Therefore, it is important that the clay subgrade (if encountered) and any engineered (particularly clay) fills are prepared or placed close (within 2%) of the soils' optimum moisture content for standard compaction and this moisture content is maintained during and after floor slab construction.

The potential to adopt a slab on ground system will also depend on the structural capacity of the slab to tolerate differential movement without distress and the consequence to building use if differential movement occurs. **If some differential movement of the slab on ground cannot be accommodated or tolerated, we recommend the adoption of a suspended floor slab and the potential inclusion of a void former beneath the slab to guard against excessive movement as a result of swelling of the clays beneath. We expect the use of a slab on ground may be tolerated within carpark areas where some differential movement may be accepted. However, in habitable area we expect differential movement will not be tolerated and in these areas we would recommend a suspended floor slab be adopted spanning between and supported by the building footings.**

We recommend that any slab on ground floor systems are made structurally independent of building footings and are well-articulated to allow moisture change induced movements to occur without structural distress.

8.7 Subgrade Design

Based on the laboratory test results we recommend that a design subgrade CBR of 3.0 % be adopted for flexible pavements constructed on a subgrade comprising the Unit 2a medium to high plasticity clay soils.

For the purposes of concrete pavement design the short and long term Young's Modulus parameters for the subgrade may be estimated from Figure 1.24 of the Cement and Concrete Association of Australia (CCAA) Industry Guide -T48, Guide to Industrial Floors and Pavements – 1997 (last revised October 2009).

9.0 EARTHQUAKE DESIGN

The methods of assessing earthquake risk classification and consequential design implications are outlined in Australian Standards AS 1170.4 – 2007, 'Structural Design Actions Part 4: Earthquake actions in Australia'. The standard uses a number of factors in assessing an earthquake design category for a particular structure at a given site.

The stratigraphy at this site is likely to include a layer of fill and residual clays over variably weathered siltstone. The thickness of soil above the weathered siltstone is more than 3 m and therefore we consider that a site Sub-Soil Class of C_e – shallow soil site can be adopted.

The hazard factor (Z) depends on the geographic location of the site. The hazard factor (Z) for Melbourne presented in Table 3.2 of AS 1170.4 – 2007 is 0.08.

10.0 IMPORTANT INFORMATION

Your attention is drawn to the document - 'Important information relating to this report' (LEG04, RL2) which is included in Appendix E of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder, but rather to ensure that all parties who may use this report aware of the responsibilities each assumes in so doing.

We would be pleased to answer any questions the reader may have regarding this 'Important Information'.

Signature Page

Golder Associates Pty Ltd

Paul Strasser
Geotechnical Engineer

Doug Goad
Principal

PGS/DLG/pgs

A.B.N. 64 006 107 857

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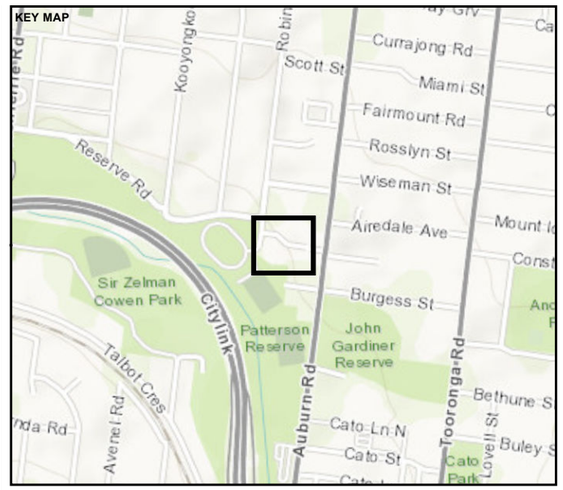

LEGEND

- Geotechnical Borehole Location
- Testpit Location
- Borehole with Groundwater Monitoring Well
- Site Extent

0 10 20

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NOTE(S)

1. PROJECTION: GDA 1994 MGA ZONE 55.

REFERENCE(S)

1. AERIAL IMAGERY SOURCED FROM NEARMAP.COM, DATE OF CAPTURE 28/04/2020.
2. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
3. STATE DATA SOURCED FROM DATA.VIC.GOV.AU.

CLIENT
HAYBALL PTY LTD

PROJECT
PUBLIC HOUSING RENEWAL PROGRAM

TITLE
INVESTIGATION LOCATION PLAN - BILLS STREET HAWTHORN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-22
DESIGNED	CJS
PREPARED	CJS
REVIEWED	DLG
APPROVED	DLG

PROJECT NO.	CONTROL	REV.	FIGURE
20145767	022-R	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A1

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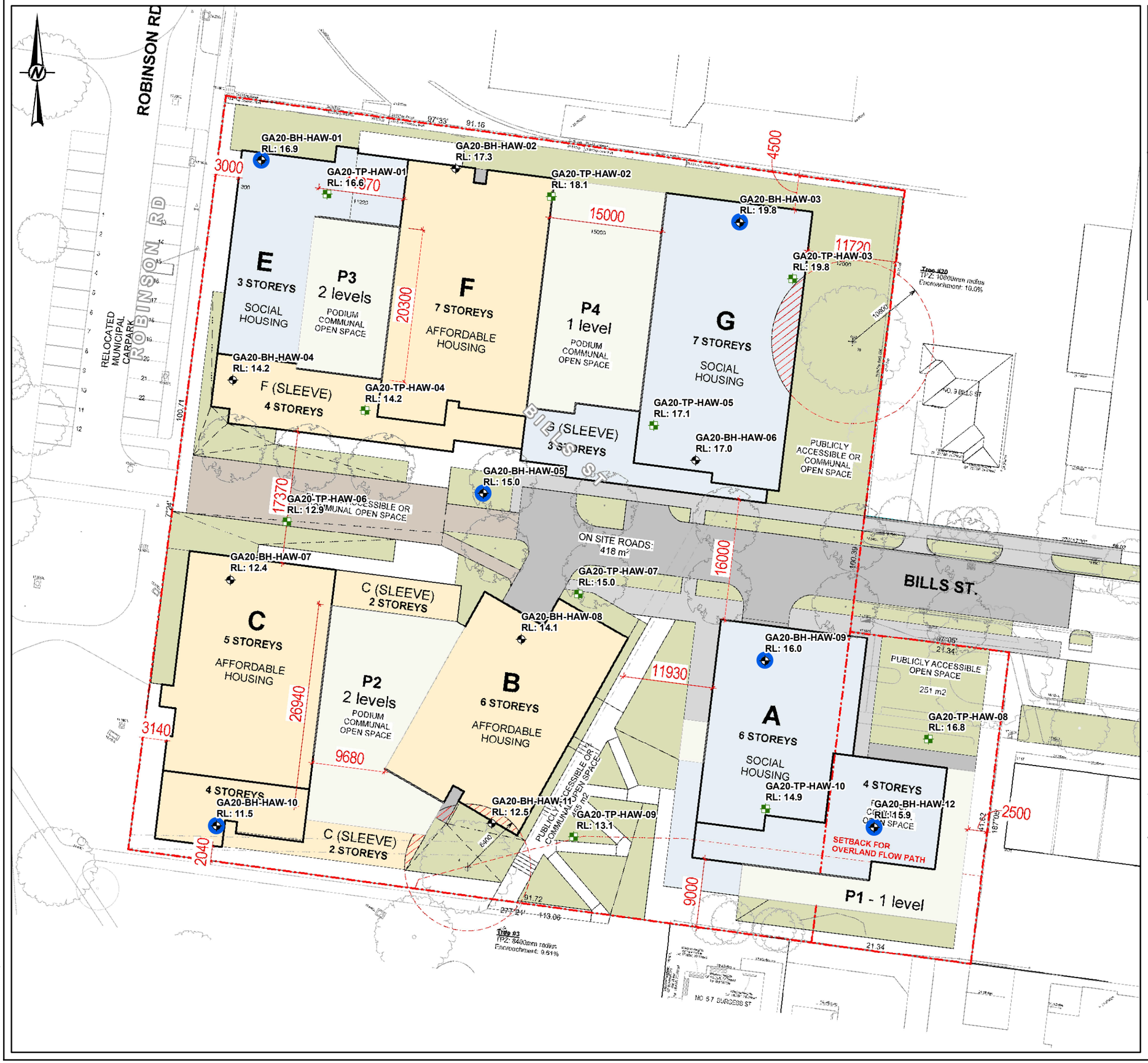

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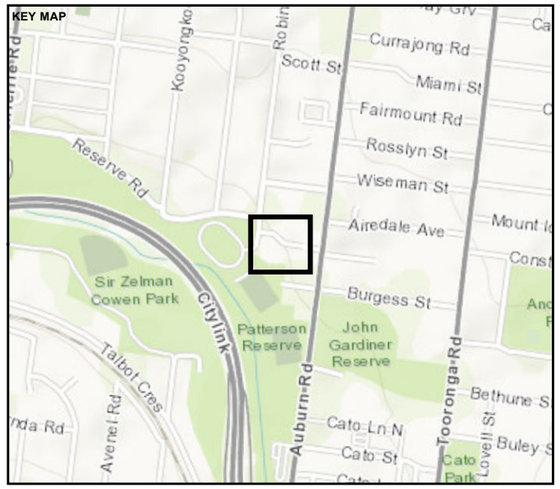


LEGEND

- Geotechnical Borehole Location
- Testpit Location
- Borehole with Groundwater Monitoring Well

0 10 20
1:500 METRES

NOTE(S)
1. PROJECTION: GDA 1994 MGA ZONE 55.

REFERENCE(S)
1. PLAN SOURCED FROM HAYBALL DRAWING 2480 A00.03 REV 7.
2. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
3. STATE DATA SOURCED FROM DATA.VIC.GOV.AU.

CLIENT
HAYBALL PTY LTD

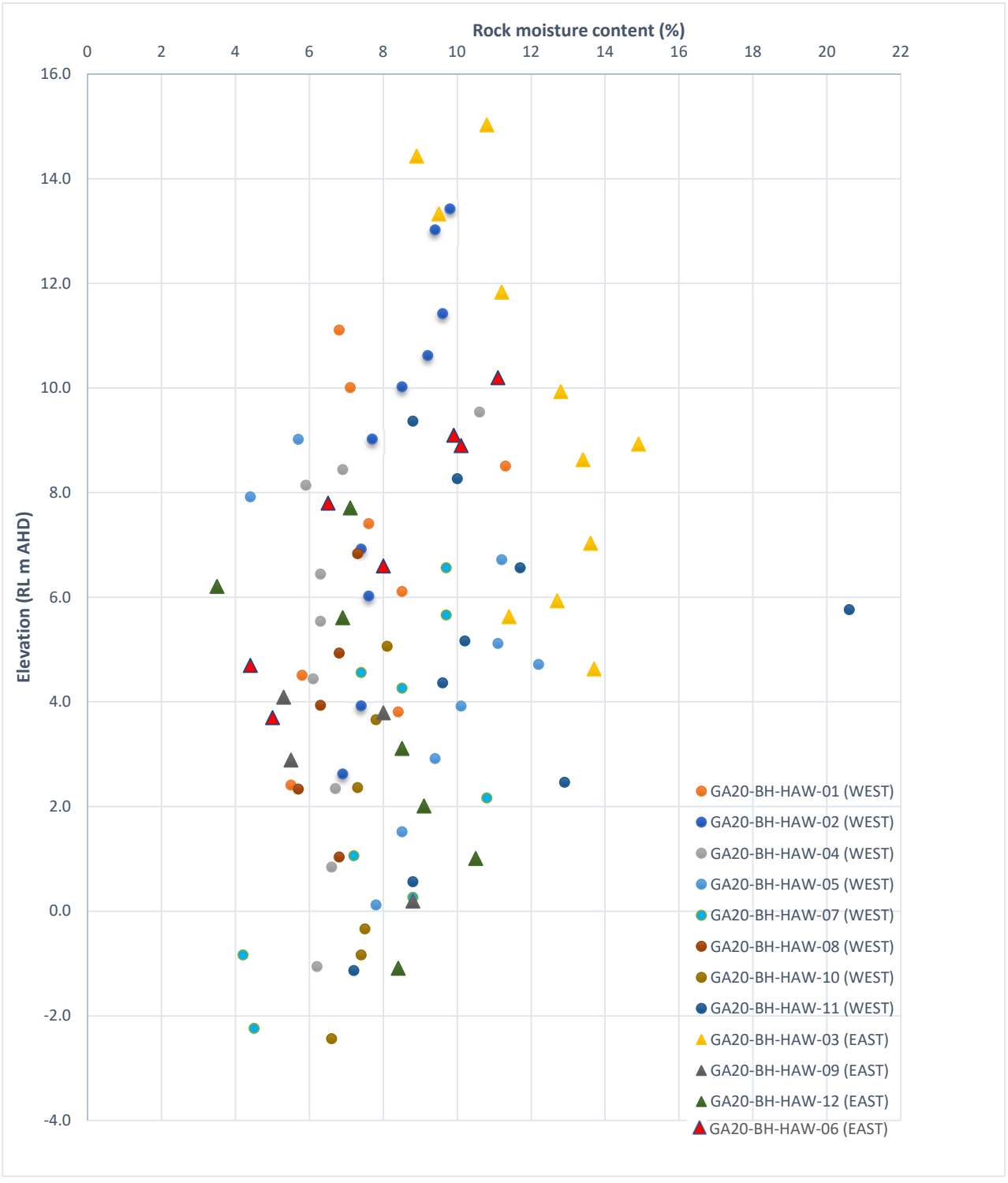
PROJECT
PUBLIC HOUSING RENEWAL PROGRAM

TITLE
INVESTIGATION LOCATION PLAN WITH PROPOSED BUILDING DEVELOPMENT LAYOUT - BILLS STREET, HAWTHORN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-23
DESIGNED	CJS
PREPARED	CJS
REVIEWED	DLG
APPROVED	DLG

PROJECT NO.	CONTROL	REV.	FIGURE
20145767	022-R	0	2



CLIENT

Hayball Pty Ltd

CONSULTANT

GOLDER

DD/MM/YY	19-10-20
PREPARED	PGS
REVIEWED	EH

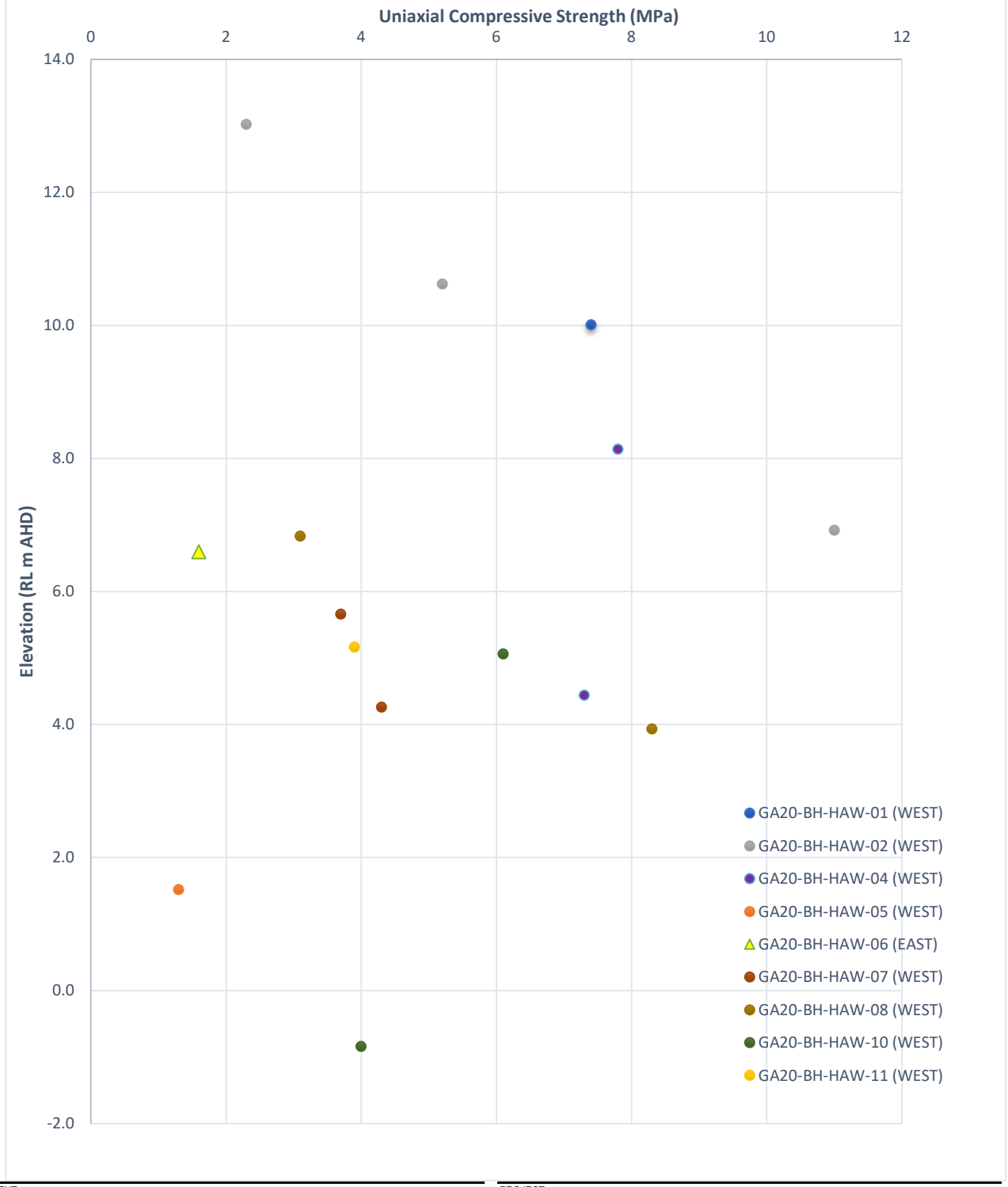
PROJECT

1-7 Bills Street and 151-153 Robinson Road, Hawthorn

TITLE

Rock moisture content vs elevation

PROJECT No.	DOC No.	Rev.	Figure No.
20145767	022-R	0	3



CLIENT

Hayball Pty Ltd

CONSULTANT

GOLDER

DD/MM/YY	19-10-20
PREPARED	PGS
REVIEWED	EH

PROJECT

1-7 Bills Street and 151-153 Robinson Road, Hawthorn

TITLE

Uniaxial Compressive Strength vs elevation

PROJECT No.	DOC No.	Rev.	Figure No.
20145767	022-R	0	4

APPENDIX A

Reports of Boreholes GA20-HAW-BH-01 to GA20-HAW-BH-12 Information Sheets

REPORT OF BOREHOLE: GA20-BH-HAW-01

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327566.8 m E 5810364.8 m N MGA94 55
SURFACE RL: 16.9 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.57 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 18-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	16.90	GA20-BH-HAW-01/2001/2801/2901 DS 0.00-0.10 m PID=0.1 R = 1A			CI	CLAY medium plasticity, brown, orange, yellow, trace fine to coarse grained, sub-angular to angular gravel	w < PL - w ~ PL	F - St	INFERRED FILL
				0.50								
				16.40	GA20-BH-HAW-01/2002 DS 0.40-0.50 m PID=0.1 R = 1A			CI-CH	Sandy CLAY medium plasticity, white, yellow, red, fine to coarse grained sand			
			1	1.00	GA20-BH-HAW-01/2003 DS 0.90-1.00 m PID=0.1 R = 0A					w < PL		
				15.90				CH	Sandy CLAY high plasticity, yellow, orange, fine to coarse grained sand		St	INFERRED RESIDUAL SILTSTONE
				1.30								
				15.60					pale grey and white			
				1.50	GA20-BH-HAW-01/2004 DS 1.40-1.50 m PID=0.0 R = 0A							
				15.40	GA20-BH01-001 SPT 1.50-1.80 m 6, 20/150mm HB			SC	Clayey SAND fine grained, orange, high plasticity clay	D - M	D	
			2	2.50								
				14.40				CI	CLAY medium plasticity, brown, trace fine to coarse grained sand			
				2.90								
	L-M			14.00	GA20-BH01-002 SPT 2.90-3.25 m 12, 19, 11/50mm HB				pale grey and grey and orange, no sand			
WB		100% Water RETURN	3							w < PL	H	
			4	4.50								
NMLC				12.40	GA20-BH01-003 SPT 4.50-4.95 m 5, 12, 24 N=36				orange with red, trace fine grained, sub-angular gravel			
			5	5.00								
				11.90					pale brown			
				5.30								
									GRAVEL fine - coarse grained, poorly graded, sub-angular, brown, orange, siltstone	M	D	
									For Continuation Refer to Sheet 2			
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA20-BH-HAW-01

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327566.8 m E 5810364.8 m N MGA94 55
SURFACE RL: 16.9 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.57 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 18-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
				4								
				5								
					5.36		Continuation of Sheet 1					
NMLC	100% Water RETURN	100	60 (100)	6	11.54		SILTSTONE pale brown, bedding at approximately 80 degrees	HW			5.36-5.48 m: J, 80°, Pl, Sm, SAND Ct 5.38-5.55 m: DBX2, sp = 170 mm 5.50 m: J, 0°, Un, Sm, CLAY Ve 5.63-5.96 m: JX3, 0°, sp = 110-200 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve 6.00-6.38 m: JX3, 0°, sp = 80-150 mm, Un, Sm-Ro, FeO, GRAVEL Sn-Ct	
					6.46							
		100	60 (100)	7	10.44		grey brown	HW - MW			7.48 m: J, 0°, Pl-Un, Ro, FeO, GRAVEL Sn-Ct	
		100	40 (100)	8	*8.00* 8.90		orange brown	HW			7.89 m: J, 0°, Pl, Sm-Ro, FeO, CLAY Sn-Ve 8.00 m: J, 20°, Pl, Sm-Ro, FeO, GRAVEL Sn-Ct, <20 mm 8.05-8.43 m: JX6, 0°, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve	
					8.50							
		100	55 (100)	9	8.40		pale grey brown	MW			8.50 m: J, 10°, Pl, Sm-Ro, FeO, CLAY Sn-Ve 8.73 m: J, 15°, Cv, Sm-Ro, FeO, GRAVEL Sn-Ct 8.86 m: J, 10°, Pl, Sm, CLAY Ve 9.14 m: J, 15°, Pl, Ro, FeO Sn 9.27 m: J, 5-20°, sp = 10-20 mm, Pl-Un, Sm-Ro, FeO, GRAVEL Sn-Ct 9.43 m: J, 0°, Un, Ro, FeO, GRAVEL Sn-Ct 9.60 m: J, 0°, Pl, Sm-Ro, FeO, CLAY Sn-Ve 9.75-10.10 m: J, 85°, Pl, Sm, CLAY Ve	
				10	*10.00*							

REPORT OF BOREHOLE: GA20-BH-HAW-01

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327566.8 m E 5810364.8 m N MGA94 55
SURFACE RL: 16.9 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.57 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 18-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	100	35 (100)	10	6.90		SILTSTONE orange brown, bedding at approximately 80 degrees	HW			10.14-10.49 m: JX4, 0°, sp = 60-180 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve 10.61-10.70 m: JX2, 0-10°, sp = 100 mm, Pl-Un, Sm-Ro, Feo, CLAY, SAND Sn-Ct 10.92 m: J, 5°, Un, Sm, FeO, CLAY Sn-Ve 11.09-11.33 m: JX4, 0-30°, sp = 0-120 mm, Pl-Un, Sm-Ro, Feo, CLAY, SAND Sn-Ct	
				11	*11.50* 5.40		pale grey brown	HW - MW			11.43 m: J, 0°, Pl, Ro, FeO Sn 11.50-11.60 m: JX4, 0-90°, sp = 0-50 mm, Pl-Un, Sm-Ro, Feo, CLAY, SAND Sn-Ct 11.69-11.85 m: JX2, 0°, sp = 250 mm, Pl, Ro, FeO Sn	
		100	60 (100)	12	*12.00* 4.90		brown, iron oxide				12.07-12.67 m: JX9, 0-5°, sp = 30-200 mm, Un, Ro, FeO, fine GRAVEL Sn-Ct, drilling induced some opening	
				13	*12.60* 4.30		brown grey	MW - SW			13.19-13.62 m: JX4, 0-30°, sp = 70-250 mm, Pl-Un, Sm-Ro, FeO, SAND, GRAVEL Sn-Ct 13.65 m: J, 20°, Pl, Sm-Ro, FeO Sn	
		100	75 (100)	14	*14.00* 2.90		grey with brown				13.90 m: J, 40°, Pl, Sm-Ro, FeO Sn 14.35-14.39 m: Jmultiple, 30°, sp = 0-5 mm, Pl, Sm-Ro, FeO, GRAVEL Sn-Ct	
					14.57 2.33		END OF BOREHOLE @ 14.57 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 9.00 m DEPTH STANDPIPE INSTALLED					
				15								
				16								
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-02

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327594.2 m E 5810363.4 m N MGA94 55
SURFACE RL: 17.3 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.92 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 17-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M		0	17.30	GA20-BH-HAW-02/2001 DS 0.00-0.10 m PID=0.1 R = 1A			SC	Clayey SAND fine - coarse grained, brown, medium plasticity clay, trace fine to coarse grained, sub-angular to anguar gravel, trace glass fragments and roots	M - W	L - MD	INFERRED FILL
				0.30								
				17.00	GA20-BH-HAW-02/2002 DS 0.40-0.50 m PID=0.0 R = 0A			CI	Sandy CLAY medium plasticity, pale grey, fine to medium grained sand	w ~ PL - w > PL	St	INFERRED RESIDUAL SILTSTONE
			1	*1.00*	GA20-BH-HAW-02/2003 DS 0.90-1.00 m							
				16.30	PID=0.0 R = 0A			CH	Sandy CLAY high plasticity, orange and pale grey, fine to medium grained sand	w ~ PL		
				1.50	GA20-BH-HAW-02/2004							
			2	15.80	DS 1.40-1.50 m PID=0.0 R = 0A GA20-BH02-001 SPT 1.50-1.95 m 7, 7, 12 N=19			CH	CLAY high plasticity, orange and grey, with fine to medium grained sand, with fine to coarse grained, sub-rounded to sub-angular gravel	w < PL	VSt	
				2.80								
			3	14.50	GA20-BH02-002 SPT 3.00-3.35 m 6, 9, 7/50mm HB				SILTSTONE pale grey, medium plasticity clay to extremely weathered siltstone	w < PL	VSt - H	
									For Continuation Refer to Sheet 2			
			4									
			5									
			6									
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01a RL3

REPORT OF BOREHOLE: GA20-BH-HAW-02

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327594.2 m E 5810363.4 m N MGA94 55
SURFACE RL: 17.3 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.92 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 17-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
					3.40		Continuation of Sheet 1					
NMLC	100% Water RETURN	70	35 (50)	4	13.75		SILTSTONE pale grey, bedding indiscernible	XW				
							pale brown	HW			3.73 m: JX2, 60-70°, sp = 0-50 mm, Pl, Sm, CLAY, SAND Ve-Ct 3.80 m: J, 0°, Pl, Sm, Cn 3.87 m: J, 30°, Pl, Sm, Cn 4.02 m: J, 0°, Un, Sm, Cn 4.17 m: DB 4.38-4.46 m: JX2, 0°, Pl-Un, Sm, CLAY Ve	
		100	35 (100)					HW - MW			4.65-5.00 m: J, 85°, Pl, Sm, CLAY Cn-Ve	
		95	0 (95)	5				HW			4.82 m: J, 5°, Pl, Sm, CLAY Ve 4.90-5.47 m: J, 85°, Pl, Sm, CLAY Ve 5.07-5.27 m: JX4, 0°, sp = 50-110 mm, Pl, Sm, FeO Sn	
					5.47							
		100	15 (85)	6	11.80		CORE LOSS	HW - MW			5.50-5.80 m: J, 80-90°, Pl, Sm, CLAY Ve 5.66 m: J, 45°, Pl, Sm, CLAY Cn-Ve	
							SILTSTONE pale brown, bedding at approximately 70 to 80 degrees	HW			6.17-6.40 m: Jx8, 0-10°, sp = 10-60 mm, Pl-Un, Sm, FeO, CLAY, SAND Sn-Ct 6.40-6.50 m: Jmultiple, 60-75°, sp = 0-40 mm, Pl-St, Sm, Cn 6.50-6.60 m: CS, GRAVEL, <100 mm	
		100	40 (100)	7	6.95 10.35		brown with brown grey	HW - MW MW			6.78 m: J, 10°, Pl, Sm, CLAY Ve 6.89 m: J, 40°, Pl, Sm, FeO, CLAY Sn-Ve 7.10 m: J, 10°, Pl, Sm, CLAY Ve 7.14 m: J, 0°, Pl-Un, Sm, FeO Sn 7.17 m: JX2, 0-40°, sp = 0-20 mm, Pl, Sm, FeO, CLAY Sn-Ve 7.40-7.50 m: JX3, 0-15°, sp = 50-70 mm, Pl, Sm, CLAY Cn-Ve, disturbed by drilling 7.53 m: J, 30°, Pl, Sm, FeO Sn 7.64 m: J, 10°, Pl, Sm, FeO Sn	
				8	7.90 9.40		brown grey with brown				7.74 m: J, 0°, Un, Sm, FeO, SAND, GRAVEL Sn-Ct 8.10-8.30 m: J, 80°, Pl, Sm, FeO Cn-Sn 8.10-8.30 m: J, 80°, Pl, Sm, FeO Cn-Sn 8.35-8.60 m: JX3, 0°, sp = 110-150 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve 8.68-9.03 m: Jmultiple, 0-90°, sp = 0-60 mm, Pl-Un, Sm, FeO Sn	
		100	35 (100)	9							9.14 m: J, 20°, Pl, Sm, CLAY Cn-Ve	
		100	65 (100)								9.43 m: J, 15°, Pl, Sm, FeO Sn 9.58 m: J, 50°, Pl-Un, Sm, Cn 9.77 m: J, 0-10°, Un-St, Sm, Cn	
				10	10.00							

REPORT OF BOREHOLE: GA20-BH-HAW-02

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327594.2 m E 5810363.4 m N MGA94 55
SURFACE RL: 17.3 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.92 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 17-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	100	65 (100)	10	7.30		SILTSTONE brown grey with brown, bedding at approximately 70 to 80 degrees	MW			10.05 m: HB 10.17-10.21 m: JX2, 0-10°, sp = 20-40 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve	
		100	85 (95)	11							10.82 m: EWS, GRAVEl, SAND, <40 mm 11.06 m: J, 5°, Pl, Sm, Cn 11.25 m: J, 30°, Pl-Un, Sm, CLAY, SAND Ve-Ct 11.40 m: J, 5°, Pl, FeO, CLAY Sn-Ve	
					11.80 5.50		orange brown	HW - MW			11.82 m: J, 0°, Pl-Un, Sm, CLAY Cn-Ve	
		100	35 (100)	12							12.00-12.12 m: J, 80°, Un, Ro, FeO, SAND Sn-Ct 12.12-12.90 m: IS, CLAY, <80 mm 12.12-12.18 m: JX4, 0°, Pl-Un, Sm, SAND Ct	
					12.90 4.40		pale brown	MW			12.12-12.90 m: IS, CLAY, <80 mm 12.26-12.43 m: JX2, 50°, Pl, Ro, FeO, SAND Sn-Ct 12.46-12.55 m: JX2, 0-5°, Pl, Sm-Ro, FeO Sn 12.55-12.68 m: J, 80-90°, Cv, Ro, FeO, SAND Sn-Ct 12.77 m: J, 0°, Pl, Sm, CLAY Ve 13.03-13.26 m: JX5, 0-45°, sp = 30-120 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve	
				13	*13.60* 3.70		grey brown				13.40-13.45 m: J, 45°, Pl, Sm, FeO, CLAY Sn-Ve 13.54-13.62 m: JX3, 0-20°, sp = 20-70 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve 13.93 m: J, 0°, Pl-Un, Sm, CLAY Ve 13.99-14.08 m: JX3, 0-45°, sp = 0-70 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve 14.15 m: J, 0°, Pl, Sm, CLAY Ve 14.19-14.23 m: CS, FeO, GRAVEL Sn-Ct, <50 mm	
		100	40 (100)	14							14.34-14.39 m: J, 50°, Pl, Sm, CLAY Ve 14.38-14.50 m: J, 80°, Pl, Sm, CLAY Ve 14.49-14.59 m: JX2, 0-20°, sp = 100 mm, Pl-Un, Sm, CLAY Ve 14.71-14.83 m: JX4, 0-90°, sp = 0-50 mm, Pl-Un, Sm-Ro, FeO, CLAY, SAND, GRAVEL Sn-Ct	
					14.92 2.38		END OF BOREHOLE @ 14.92 m TARGET DEPTH GROUNDWATER NOT OBSERVED BACKFILLED					
				15								
				16								
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-03

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327631.9 m E 5810356.3 m N MGA94 55
SURFACE RL: 19.8 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.45 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 21-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M		0	19.80	GA20-BH-HAW-03/2001 DS 0.00-0.10 m PID=0.1 R = 1A			CI	Sandy Gravelly CLAY medium plasticity, brown, fine to coarse grained, sub-angular to angular gravel, fine to coarse grained sand, with grass	w < PL	F	INFERRED FILL
				0.40 19.40	GA20-BH-HAW-03/2002 DS 0.40-0.50 m PID=0.1 R = 0A			CH	CLAY high plasticity, orange brown with red and grey, trace fine to coarse grained sand	w < PL - w ~ PL	St	INFERRED RESIDUAL SILTSTONE
			1	*1.00* 18.80	GA20-BH-HAW-03/2003 DS 0.90-1.00 m PID=0.1 R = 0A				orange with pale grey and red, trace fine to coarse grained, sub-rounded to sub-angular gravel			
	M			*1.50* 18.30	GA20-BH-HAW-03/2004 DS 1.40-1.50 m PID=0.0 R = 0A GA20-BH03-001 SPT 1.50-1.77 m 7, 18/120mm HB				orange with pale grey, with fine to coarse grained, sub-angular gravel, trace fine to coarse grained sand	w < PL	VSt - H	
			2						For Continuation Refer to Sheet 2			
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA20-BH-HAW-03

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327631.9 m E 5810356.3 m N MGA94 55
SURFACE RL: 19.8 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.45 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 21-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2	2.00		Continuation of Sheet 1					
NMLC	100% Water RETURN	100	0 (30)		17.80		SILTSTONE brown orange with brown, bedding indiscernible	XW - HW			2.06-2.20 m: IS, CLAY, GRAVEL, <140 mm 2.20-2.25 m: J, 90°, Pl, Sm, CLAY Ve 2.25-2.30 m: CS, <50 mm 2.32-2.39 m: J, 80°, Pl, Sm, CLAY Ve 2.37-2.53 m: J, 85°, Pl-Un, Sm, CLAY Ve 2.38-2.41 m: Jmultiple, 0-90°, Pl, Sm, CLAY Cn-Ve 2.46-2.52 m: JX2, 0°, sp = 120 mm, Pl, Sm, CLAY Cn-Ve 2.55-2.65 m: CS, <100 mm, disturbed by drilling	
		100	0 (100)		2.65							
		20	0 (0)	3	17.15 3.67		CORE LOSS					
		100	0 (0)	4	16.13 4.60		SILTSTONE/BRECCIA pale grey and orange and brown, angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW				
		100	0 (75)	5	15.20 5.12		SILTSTONE pale brown, bedding indiscernible	HW			4.65-4.68 m: CS, probably induced by drilling 4.74 m: J, 40°, Pl, Sm, CLAY Cn-Ve 4.74-4.85 m: J, 85-90°, Un-St, Sm, Cn	
		85	20 (85)		14.59 5.70		CORE LOSS SILTSTONE brown orange with brown, bedding indiscernible	HW XW - HW			4.74 m: J, 40°, Pl, Sm, CLAY Cn-Ve 4.74-4.85 m: J, 85-90°, Un-St, Sm, Cn 4.75-4.80 m: J, St, Sm, probably induced by drilling 4.85-4.88 m: CS, GRAVEL, <30 mm 4.90-4.94 m: J, 70°, Un, Sm, CLAY, GRAVEL Ct	
		60	0 (50)	6	14.10 6.12 13.68 6.70		CORE LOSS SILTSTONE/BRECCIA pale brown	XW - HW			5.03 m: J, 40°, Un, Sm, CLAY, SAND Ct 5.30 m: J, 45°, Pl-Un, Sm, CLAY, SAND Ve-Ct 5.35 m: J, 0°, Un, Sm, GRAVEL Ct, drilling induced opening 5.50 m: J, 15°, Pl, Sm, CLAY, GRAVEL Ve-Ct	
		30	0 (20)	7	13.10 7.35		CORE LOSS				5.55-5.70 m: J, 85°, Pl, Sm, SAND, GRAVEL Ct, disturbed by drilling 6.12-6.20 m: J, 85°, Pl, Sm, CLAY Ve, disturbed by drilling 6.19-6.25 m: JX2, 0-10°, sp = 60 mm, Pl-Un, Sm, GRAVEL Ct 6.19-6.38 m: J, 80°, Pl, Sm, CLAY Ct, disturbed by drilling	
		100	40 (100)	8	12.45 8.10		SILTSTONE/BRECCIA pale brown	XW - HW			6.19-6.25 m: JX2, 0-10°, sp = 60 mm, Pl-Un, Sm, GRAVEL Ct 6.19-6.38 m: J, 80°, Pl, Sm, CLAY Ct, disturbed by drilling	
		80	25 (45)		11.63 8.50		CORE LOSS SILTSTONE/BRECCIA pale grey brown, iron oxide	XW - HW			6.40-6.47 m: JX3, 5°, sp = 30-40 mm, Pl, Sm, CLAY Cn-Ve 6.54 m: EWS, SAND, <30 mm 6.59-6.70 m: EWS, CLAY, SAND, GRAVEL, <110 mm	
		75	0 (55)	9	8.68 11.12 9.30		CORE LOSS SILTSTONE/BRECCIA pale brown, iron oxide	XW - HW			7.38-7.43 m: IS, CLAY, <50 mm 7.47-7.77 m: JX4, 0-10°, Un, Sm-Ro, CLAY, SAND Ve-Ct, drilling induced opening 7.90 m: J, 45°, Pl, Sm, CLAY Ve 8.07 m: J, 0°, Pl-Un, Sm, CLAY Ve-Ct	
		70	0 (60)	10	10.50 9.78 10.02		CORE LOSS				8.17-8.23 m: EWS, CLAY, SAND, GRAVEL, <50 mm 8.40 m: J, 65°, Pl, Sm, CLAY, fine quartz GRAVEL Ve-Ct 8.42-8.50 m: EWS, CLAY, <80 mm 8.80-8.95 m: JX5, 0-30°, sp = 0-60 mm, Un,	

REPORT OF BOREHOLE: GA20-BH-HAW-03

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327631.9 m E 5810356.3 m N MGA94 55
SURFACE RL: 19.8 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.45 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 21-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	70	0 (60)	10			SILTSTONE/BRECCIA pale grey and pale brown, iron oxide	XW - HW			Sm-Ro, FeO, SAND, GRAVEL, CLAY Sn-Ct 9.02-9.06 m: IS, CLAY, SAND, GRAVEL, <40 mm 9.10-9.15 m: JX2, 60-70°, sp = 0-20 mm, Pl, Sm, CLAY Ve, disturbed by drilling 9.15-9.30 m: EWS, CLAY, <150 mm 9.84 m: J, 5°, Un, Sm, CLAY Ve 9.92 m: DB 10.08-10.11 m: JX2, 0-40°, sp = 0-30 mm, Un, Sm-Ro, FeO, CLAY Sn-Ve, disturbed by drilling 10.18-10.25 m: DBX2, sp = 70 mm 10.38 m: JX2, 0-60°, sp = 0-50 mm, Pl-Un, Sm, SAND, GRAVEL Ct 10.46 m: DB 10.49-10.54 m: EWS, CLAY, SAND, <50 mm 10.66-10.85 m: EWS, <200 mm 11.05-11.13 m: JX3, 0-20°, sp = 30-50 mm, Pl-Un, Sm, SAND Ct, disturbed by drilling 11.27-11.44 m: JX5, 0-10°, sp = 30-50 mm, Un, Sm, FeO, SAND, GRAVEL Sn-Ct 12.04-12.18 m: DBX2 12.30-12.36 m: EWS, CLAY, GRAVEL, <60 mm 12.40-12.50 m: EWS, CLAY, <100 mm 12.84 m: J, 20°, Pl-Un, Sm, CLAY, SAND Ve-Ct 13.08 m: J, 40°, Pl, Sm, GRAVEL Ct, disturbed by drilling 13.12-13.15 m: J, 30°, Pl, Sm, CLAY Ct, <30 mm 13.23 m: J, 0°, Un, Sm-Ro, FeO, GRAVEL Sn-Ct 13.29-13.40 m: Jmultiple, 45-55°, sp = 0-20 mm, Pl, Sm-Ro, FeO, GRAVEL Sn-Ct 13.44-13.50 m: EWS, <60 mm 14.09-14.18 m: DBX3 14.21-14.28 m: EWS, CLAY, SAND, <70 mm 14.30 m: J, 0°, Pl-Un, Sm, CLAY, SAND Ct, <5 mm 14.34-14.38 m: J, 60°, Pl, Sm, CLAY Ct, <40 mm 14.39-14.52 m: Jmultiple, 0-90°, sp = 0-20 mm, Pl, Sm, CLAY Cn-Ve 14.54-14.60 m: EWS, CLAY, <60 mm 15.00-15.06 m: J, 70°, Pl, Sm-Ro, FeO, GRAVEL Sn-Ct 15.06-15.13 m: EWS, CLAY, GRAVEL, <70 mm 15.20 m: J, 60°, Pl, Sm, CLAY Ve 15.24 m: J, 0°, Pl-Un, Sm, CLAY, SAND Ct, <10 mm 15.28-15.30 m: EWS, CLAY, SAND, GRAVEL, <20 mm 15.30-15.40 m: J, 0-90°, sp = 0-20 mm, Pl, Sm, CLAY Cn-Ve	
		100	15 (100)	11	11.52							
		60	10 (45)	12	8.28 11.90 7.90		CORE LOSS SILTSTONE/BRECCIA pale brown and pale grey with brown, gravel to cobble sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW				
		85	10 (75)	13	12.50 12.67 7.13		XW CORE LOSS SILTSTONE/BRECCIA pale brown and pale grey with brown, gravel to cobble sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW				
		60	30 (60)	14	13.50 6.30 13.74 6.06		CORE LOSS SILTSTONE/BRECCIA pale grey with brown, gravel to cobble sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW				
		100	0 (75)		14.60							
		55	0 (35)	15	5.20 15.00 4.80		CORE LOSS SILTSTONE/BRECCIA pale grey with brown, gravel to cobble sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW				
				16	15.45 4.35		END OF BOREHOLE @ 15.45 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 8.40 m DEPTH STANDPIPE INSTALLED					
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-04

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327564.6 m E 5810335.3 m N MGA94 55
SURFACE RL: 14.2 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.35 m

DRILL RIG: Comacchio Geo 305
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 1-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M		0	14.20	GA20-BH04/2001 DS 0.00-0.10 m PID=0.1 R = 2A			CI	FILL: Gravelly Sandy CLAY medium plasticity, brown, fine to coarse grained sand, fine to coarse grained, sub-rounded to sub-angular gravel, trace wood, glass, brick fragments	w < PL	F - St	INFERRED FILL
				0.30 13.90	GA20-BH04/2002 DS 0.40-0.50 m PID=0.0 R = 0A			CI	FILL: Sandy CLAY medium plasticity, pale grey with pale brown, fine to medium grained sand			
			1	1.00 13.20	GA20-BH04/2003 DS 0.90-1.00 m PID=0.2 R = 0A			CI	Sandy CLAY medium plasticity, brown, fine to coarse grained sand, trace fine grained gravel, trace roots	w < PL - w ~ PL	St	INFERRED RESIDUAL SILTSTONE
				1.50 12.70	GA20-BH04/2004 DS 1.40-1.50 m PID=0.0 R = 0A GA20-BH04-001 U63 1.50-1.90 m PP = 450-530 kPa			CI	CLAY medium plasticity, orange and pale grey		VSt - H	
WB			2									
			3	3.00 11.20	GA20-BH04-002 SPT 3.00-3.45 m 2, 4, 9 N=13				orange and pale grey with grey	w < PL		
				3.30 10.90					trace fine to medium grained, sub-rounded to sub-angular gravel, trace fine to coarse grained sand		St - VSt	
			4		GA20-BH04-003 SPT 3.80-4.25 m 6, 8, 16 N=24						VSt	
				4.50	GA20-BH04-004 SPT 4.50-4.60 m 10/100mm HB				SILTSTONE orange and pale grey, extremely weathered siltstone		H - Fb	
			5						For Continuation Refer to Sheet 2			
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA20-BH-HAW-04

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327564.6 m E 5810335.3 m N MGA94 55
SURFACE RL: 14.2 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.35 m

DRILL RIG: Comacchio Geo 305
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 1-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
				4	4.60		Continuation of Sheet 1					
NMLC	100% Water RETURN	120	0 (100)	5	9.60		SILTSTONE orange with pale grey, bedding indiscernible	HW			4.70 m: IS, CLAY, <10 mm 4.70-4.90 m: J, 90°, Pl-Un, Sm, CLAY Ct, <2 mm 4.70 m: IS, CLAY, <10 mm 4.70-4.90 m: J, 90°, Pl-Un, Sm, CLAY Ct, <2 mm 4.91 m: IS, CLAY, SAND, <30 mm 4.95-5.40 m: Jmultiple, 0-90°, sp = 0-50 mm, Pl-Un, Sm, CLAY Ct, <5 mm 5.20-5.33 m: JX3, 0°, sp = 60-70 mm, Un, Sm, CLAY Ve-Ct, <10 mm 5.40-5.75 m: IS, CLAY, SAND, fine GRAVEL, <350 mm 5.86 m: IS, CLAY, SAND, <60 mm 6.23-6.33 m: JX2, 0-10°, sp = 90-100 mm, Pl, Sm, FeO, CLAY Sn-Ct	
		100	55 (85)	6	6.50			HW - MW				
					7.70		orange brown	MW			6.90-6.95 m: JX2, 10-20°, sp = 40-60 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve, disturbed by drilling 7.20-7.91 m: JX3, 0-10°, sp = 350 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve	
		100	70 (100)	7								
				8	8.00 6.20		pale brown				7.94-8.00 m: CS, SAND, fine GRAVEL, <60 mm 8.00-8.10 m: J, 90°, Pl, Sm, FeO Sn 8.28-8.31 m: EWS, SAND, <30 mm	
		100	50 (100)	9							8.83 m: J, 0-10°, Un, Sm-Ro, FeO, SAND Sn-Ct, <5 mm 9.10 m: JX2, 0-60°, sp = 0-50 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve 9.19-9.28 m: Jmultiple, 0-90°, sp = 0-20 mm, Pl, Sm, FeO Sn	
		100	85 (100)	10	10.00							

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GAP gINT FN. F02a
RL3

REPORT OF BOREHOLE: GA20-BH-HAW-04

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327564.6 m E 5810335.3 m N MGA94 55
SURFACE RL: 14.2 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.35 m

DRILL RIG: Comacchio Geo 305
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 1-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	100	85 (100)	10	4.20		SILTSTONE pale brown to pale grey brown, bedding indiscernible	MW			9.93 m: J, 0°, Un, Sm, FeO Sn 9.97 m: J, 0°, Pl-Un, Sm, SAND Ct, <10 mm 10.25-10.40 m: JX2, 0°, sp = 150 mm, Pl-Un, Sm, FeO Sn	
		100	70 (100)	11	11.50 2.70		pale grey brown				10.94 m: J, 0°, Un, Sm, CLAY Ve 11.40-11.60 m: JX4, 0-5°, sp = 20-130 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve 11.60-11.74 m: J, 60-70°, Pl-St, Sm, FeO, SAND, CLAY Sn-Ct	
		100	85 (100)	12	12.85 1.35		brown grey with brown	MW - SW			12.22 m: J, 0°, Pl, Sm, FeO, CLAY Sn-Ve 12.40 m: DB 12.91-12.96 m: JX2, 20-30°, sp = 40 mm, Pl, Sm, FeO, SAND Sn-Ct 13.34-13.40 m: JX3, 0-10°, sp = 10-30 mm, Pl, Sm, FeO, CLAY Sn-Ve	
		100	70 (100)	13	14.20 0.00		dark grey				14.27-14.59 m: JX2, 10°, sp = 320 mm, Pl, Sm, FeO, CLAY Sn-Ve 15.05 m: J, 0°, Pl, Sm-Ro, FeO, GRAVEL Sn-Ct, <20 mm 15.10-15.24 m: J, 70°, Pl, Sm, FeO, CLAY Sn-Ve	
				14								
				15	15.35 -1.15		END OF BOREHOLE @ 15.35 m TARGET DEPTH GROUNDWATER NOT OBSERVED BACKFILLED					
				16								
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-05

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327597.8 m E 5810320.3 m N MGA94 55
SURFACE RL: 15.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.52 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 7-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M		0	15.00	GA20-BH-HAW-05/ 2001/2801/2901 DS 0.00-0.10 m PID=0.1 R = 1A			CI	Sandy CLAY medium plasticity, brown, fine to coarse grained sand, with fine to coarse grained, sub-angular to angular gravel	w < PL		INFERRED FILL
				0.50								
				14.50	GA20-BH-HAW-05/2002 DS 0.40-0.50 m PID=0.0 R = 1A			CI	Clayey SAND fine - medium grained, medium plasticity, brown, medium plactisity clay	w ~ PL	F - St	
			1	1.00	GA20-BH-HAW-05/2003							
				14.00	DS 0.90-1.00 m PID=0.2 R = 0A			CI-CH	CLAY medium - high plasticity, orange, red, grey, with fine to coarse grained sand, trace fine grained, sub-angular gravel, trace wood fragments			
				1.50	GA20-BH05-001 SPT 1.00-1.45 m 2, 3, 5 N=8							
				13.50	GA20-BH-HAW-05/2004 DS 1.40-1.50 m PID=0.0 R = 0A			CH	CLAY high plasticity, orange and grey, trace fine grained sand		St	INFERRED RESIDUAL SILTSTONE
			2							w < PL		
WB		100% Water RETURN		2.80	GA20-BH05-002 SPT 2.50-2.95 m 4, 5, 8 N=13							
				12.20				CH	Gravelly CLAY high plasticity, grey and orange and white, fine to medium grained, sub-angular gravel		St - VSt	
			3									
				4.00								
			4	11.00	GA20-BH05-003 SPT 4.00-4.20 m 15, 5/50mm HB				SILTSTONE orange with yellow and pale grey, medium plasticity clay to extremely weathered siltstone		H - Fb	
									For Continuation Refer to Sheet 2			
			5									
			6									
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01a RL3

REPORT OF BOREHOLE: GA20-BH-HAW-05

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327597.8 m E 5810320.3 m N MGA94 55
SURFACE RL: 15.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.52 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 7-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
				4								
					4.73		Continuation of Sheet 1					
NMLC	100% Water RETURN				10.27		SILTSTONE orange and brown	XW - HW			4.73-4.83 m: EWS, CLAY, SAND, GRAVEL, <100 mm 4.83-5.00 m: Jmultiple, 0-90°, sp = 0-20 mm, Sm-Ro, FeO Sn, disturbed by drilling	
				5	*5.00*		CORE LOSS					
		60	0 (25)		10.00 *5.45*						5.45-5.55 m: CS, CLAY, GRAVEL, <100 mm, disturbed by drilling 5.60 m: J, 20°, Pl, Sm-Ro, FeO, SAND Sn-Ct	
					9.55		SILTSTONE orange and brown	XW - HW			5.64 m: JX2, 10-30°, sp = 0-20 mm, Pl, Sm-Ro, CLAY, SAND, GRAVEL Ct, <3 mm	
				6	*6.10*						5.69-5.77 m: EWS, CLAY, GRAVEL, <80 mm	
					6.20		CORE LOSS				5.80 m: J, 0-60°, St, Sm-Ro, FeO, CLAY Sn-Ve	
		80	0 (20)		8.80		SILTSTONE orange and pale grey with brown	XW			5.88-5.98 m: JX3, 0°, sp = 40-80 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve	
					6.60						5.90 m: J, 0°, Pl, Sm-Ro, FeO, CLAY, SAND Sn-Ct, <10 mm	
					8.40		CORE LOSS				6.00-6.05 m: Jmultiple, 10-80°, sp = 0-40 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve	
		45	0 (10)	7	*7.10*						6.05-6.10 m: EWS, CLAY, GRAVEL, <50 mm	
					7.90		SILTSTONE orange and brown	XW			6.20-6.43 m: Jmultiple, 0-90°, sp = 0-30 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve, disturbed by drilling	
					7.80		pale grey				6.20-6.50 m: IS, CLAY, <300 mm	
					7.85						6.20-6.43 m: Jmultiple, 0-90°, sp = 0-30 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve, disturbed by drilling	
		100	0 (45)		7.15		orange with brown	HW			6.50-6.60 m: Jmultiple, 0-90°, sp = 0-30 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve, disturbed by drilling	
				8							7.13-7.15 m: JX2, 0-10°, sp = 20-40 mm, Pl, Sm-Ro, FeO Sn	
		100	0 (100)								7.20-7.85 m: IS, CLAY, SAND, GRAVEL	
											7.90-7.94 m: JX2, 45°, sp = 40 mm, Pl-Un, Sm-Ro, FeO, SAND, GRAVEL Sn-Ct	
											7.94-7.98 m: J, 70°, Pl-Un, Sm, CLAY Ve	
				9							8.00-8.05 m: EWS, CLAY, <50 mm	
		115	5 (115)								8.05-8.22 m: J, 75°, Pl-Un, Sm, SAND Ct, <5 mm	
											8.27 m: DB	
					9.85						8.30-9.10 m: Jmultiple, 0-60°, sp = 0-100 mm, Pl, Sm-Ro, FeO, SAND Sn-Ct	
				10	5.15		pale orange grey					

REPORT OF BOREHOLE: GA20-BH-HAW-05

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327597.8 m E 5810320.3 m N MGA94 55
SURFACE RL: 15.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.52 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 7-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	115	5 (115)	10			SILTSTONE orange and brown	HW			8.45-9.11 m: J, 85°, Pl, Sm, CLAY Ve 9.10-9.85 m: J, 85°, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve 9.33-9.80 m: Jmultiple, 0-60°, Pl-Un, Sm-Ro, FeO, CLAY, SAND Sn-Ct 9.80-10.18 m: J, 85°, Pl-Un, Sm, Cn, partially closed joint 9.85 m: J, 0°, Un, Sm, CLAY Ve 10.00-10.63 m: J, 85°, Pl, Sm, CLAY Ve-Ct 10.15-10.50 m: JX3, 0-10°, Pl-Un, Sm, CLAY, SAND Ve-Ct	
		100	45 (100)	11	11.15 3.85		pale grey with brown				11.16-11.76 m: J, 85-90°, Pl-Un, Sm, FeO, CLAY Sn-Ve 11.18-11.68 m: JX5, 0-5°, sp = 100-150 mm, Pl-St, Sm, CLAY Ve	
				12	12.25 2.75		pale brown with brown grey, bedding at approximately 80 to 90 degrees	HW - MW			11.94 m: J, 0°, Pl-Un, Sm, CLAY Ve 12.10 m: J, 30°, Pl, Sm-Ro, FeO Sn 12.13-12.22 m: J, 90°, Un, Sm, CLAY Ve 12.37-12.75 m: JX4, 0-5°, sp = 50-140 mm, Pl-Un, Sm, CLAY Ve	
		100	30 (100)	13							12.81-13.30 m: Jmultiple, 0-90°, sp = 0-10 mm, Pl-St, Ro, FeO Cn-Sn	
		100	0 (100)	14							13.60 m: J, 0°, Un, Sm-Ro, FeO, CLAY Sn-Ve 13.75-14.65 m: JX2, 85-90°, sp = 0-50 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve	
		100	10 (100)	15	15.00 0.00 15.52		brown with grey brown				14.60-14.67 m: CS, disturbed by drilling 14.80-14.86 m: JX4, 0-90°, sp = 0-20 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve 15.03-15.50 m: Jmultiple, 0-90°, sp = 0-30 mm, Pl-Un, Sm-Ro, FeO Cn-Sn	
					-0.52		END OF BOREHOLE @ 15.52 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 8.20 m DEPTH STANDPIPE INSTALLED					
				16								
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-06

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327626.0 m E 5810324.7 m N MGA94 55
SURFACE RL: 17.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 13.60 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 16-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M		0	17.00	GA20-BH-HAW-06/2001 DS 0.00-0.10 m PID=0.0 R = 1A			CI	Sandy Gravelly CLAY medium plasticity, brown, fine to coarse grained, sub-angular to angular gravel, fine to coarse grained sand		F - St	INFERRED FILL
				0.30 16.70	GA20-BH-HAW-06/2002 DS 0.40-0.50 m PID=0.0 R = 0A			CH	CLAY high plasticity, orange and grey, trace fine to medium grained sand			INFERRED RESIDUAL SILTSTONE
			1	*1.00* 16.00	GA20-BH-HAW-06/2003 DS 0.90-1.00 m PID=0.0 R = 0A				orange and pale grey, trace fine grained, sub-rounded to sub-angular gravel		St	
				1.50 15.50	GA20-BH-HAW-06/2004 DS 1.40-1.50 m PID=0.0 R = 0A				orange and pale grey with red, trace fine to medium grained, sub-angular to angular gravel	w < PL		
			2	*2.00* 15.00	GA20-BH06-001 SPT 1.50-1.95 m 3, 7, 10 N=17				orange and pale grey, trace fine to coarse grained, sub-angular to angular gravel		VSt	
				2.30 14.70					pale grey			
			3	*3.00* 14.00	GA20-BH06-002 SPT 3.00-3.43 m 8, 15, 16/130mm HB				SILTSTONE pale grey, medium plasticity clay to extremely weathered siltstone	w < PL	H	
			4						For Continuation Refer to Sheet 2			
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA20-BH-HAW-06

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327626.0 m E 5810324.7 m N MGA94 55
SURFACE RL: 17.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 13.60 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 16-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
					3.50		Continuation of Sheet 1					
NMLC		100	0 (50)	4	13.50 3.72 13.28		SILTSTONE/BRECCIA pale grey, angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW			3.70-3.75 m: CS, GRAVEL, <50 mm 3.75-3.87 m: J, 80°, Pl, Sm-Ro, FeO, GRAVEL Sn-Ct 3.75-3.90 m: JX5, 30°, sp = 10-50 mm, Pl, Sm-Ro, FeO Sn	
		100	0 (65)		4.30		pale brown with pale grey and brown, Iron oxide	XW - HW			3.75-3.87 m: J, 80°, Pl, Sm-Ro, FeO, GRAVEL Sn-Ct 3.75-3.90 m: JX5, 30°, sp = 10-50 mm, Pl, Sm-Ro, FeO Sn 3.82-3.95 m: J, 80°, Pl, Sm-Ro, FeO Sn 4.05-4.15 m: IS, soft CLAY, <100 mm 4.16-4.30 m: CS, <150 mm, disturbed by drilling	
		30	0 (15)	5	12.70 5.20		CORE LOSS					
					11.80 5.60		SILTSTONE/BRECCIA pale brown with pale grey and orange, angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass, Iron oxide	XW - HW			5.20-5.35 m: CS, GRAVEL, <150 mm, disturbed by drilling 5.35-5.40 m: IS, CLAY, <50 mm 5.40-5.53 m: J, 80°, Pl, Sm-Ro, FeO Sn 5.41-5.53 m: Jmultiple, 0-45°, sp = 0-20 mm, Pl, Sm-Ro, FeO, SAND Sn-Ct 5.53-5.60 m: CS, <70 mm, disturbed by drilling	
		35	0 (0)		11.40 6.00		CORE LOSS					
				6	11.00 6.20		SILTSTONE/BRECCIA pale brown with pale grey and orange, angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW				
		20	0 (0)		10.80 6.60		CORE LOSS					
		100	30 (100)	7	10.30 7.20		SILTSTONE/BRECCIA pale brown with brown, gravel to cobble sized siltstone clasts pale brown with brown and pale grey, Iron oxide	HW			6.93 m: J, 30°, Pl-Un, Sm, CLAY Ve 7.03 m: J, 0°, Un, Sm-Ro, FeO, SAND, GRAVEL Sn-Ct, <20 mm, drilling induced opening 7.15 m: J, 0°, Un, Sm-Ro, FeO, SAND, GRAVEL Sn-Ct	
		0	0 (0)		9.80 7.75		CORE LOSS					
		100	0 (100)	8	9.25		SILTSTONE brown orange with brown and pale grey, Iron oxide	HW			7.75-7.80 m: J, 60°, Pl-Un, Sm, CLAY, SAND Ve-Ct 7.92 m: J, 0°, Un, Sm, FeO, SAND Sn-Ct	
		100	0 (90)		8.82			HW - MW			8.30-8.38 m: JX2, 0°, sp = 80 mm, Un 8.56 m: J, 0°, Un, Sm, GRAVEL Ct, <10 mm	
		60	15 (35)	9	8.18 9.08 7.92		CORE LOSS SILTSTONE/BRECCIA brown orange with brown, gravel to cobble sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW			8.63 m: J, 0°, Un, Sm-Ro, FeO, GRAVEL Sn-Ct, <30 mm, drill;ing induced opening 8.66-8.70 m: JX2, 40-50°, sp = 20-40 mm, Pl, Sm-Ro, FeO Sn 8.76-8.82 m: EWS, CLAY, <50 mm 9.26 m: J, 45°, Un, Sm, CLAY Cn-Ve 9.34-9.46 m: EWS, CLAY, GRAVEL, <120 mm	
		100	20 (100)		9.50 7.50		SILTSTONE brown orange with brown	HW - MW			9.50-9.84 m: JX5, 0-45°, sp = 0-150 mm, Pl-Un, Sm-Ro, FeO, SAND Sn-Ct 9.90-10.20 m: J, 85-90°, Pl, Sm, CLAY Ve	
				10								

REPORT OF BOREHOLE: GA20-BH-HAW-06

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327626.0 m E 5810324.7 m N MGA94 55
SURFACE RL: 17.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 13.60 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 16-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC		100		10			SILTSTONE brown orange with brown	HW - MW			10.00-10.24 m: JX4, 0°, sp = 30-100 mm 10.34 m: J, 20°, Pl-Un, Sm, CLAY Ve 10.53 m: J, 45°, Un, Sm, CLAY Ve	
		100	30 (85)	11				HW - MW			10.70-11.20 m: Jmultiple, 0-90°, sp = 0-70 mm, Pl-Un, Sm-Ro, FeO, CLAY, SAND Sn-Ct	
					11.25							
		40	0 (20)		5.75 11.79		CORE LOSS				11.20-11.25 m: EWS, CLAY, SAND, <50 mm	
				12	5.21		SILTSTONE/BRECCIA brown orange with brown, gravel to cobble sized siltstone clasts	HW - MW			11.80-11.87 m: CS, disturbed by drilling 11.85-11.95 m: J, 80°, Pl, Sm-Ro, FeO, SAND Sn-Ct 12.00-12.15 m: CS, disturbed by drilling 12.20-12.23 m: J, 70°, Un, Sm-Ro, SAND, GRAVEL Ct 12.36-12.44 m: EWS, SAND, GRAVEL, <80 mm 12.52 m: J, 0°, St, Sm-Ro, FeO Sn 12.60-12.75 m: CS, <150 mm, disturbed by drilling	
		100	20 (80)									
		75	0 (35)	13	13.00							
					13.15		CORE LOSS				12.70-12.80 m: J, 85°, Pl-Un, Sm-Ro, CLAY, SAND Ve-Ct 12.77-13.00 m: Jmultiple, 0-70°, sp = 0-30 mm, Pl, Sm-Ro, FeO Sn	
		100	0 (30)		3.85 13.60		SILTSTONE/BRECCIA brown orange with brown, angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW			12.80-12.90 m: J, 80°, Pl, Sm-Ro, SAND, CLAY Ct, <50 mm 13.15-13.20 m: CS, disturbed by drilling 13.20-13.30 m: J, 90°, Pl, Sm-Ro, SAND, CLAY Ct, <10 mm	
					3.40		END OF BOREHOLE @ 13.60 m TARGET DEPTH GROUNDWATER NOT OBSERVED BACKFILLED					
				14								
				15								
				16								
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-07

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327564.3 m E 5810308.8 m N MGA94 55
SURFACE RL: 12.4 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.70 m

DRILL RIG: Comacchio Geo 305
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 31-8-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M		0	12.40	GA20-BH07/2001			CI	FILL: CLAY	w < PL	F - St	INFERRED FILL
				0.20	DS 0.00-0.10 m				medium plasticity, brown, with fine to coarse grained sand, trace fine to medium grained, sub-rounded to sub-angular gravel, grass			
				12.20	PID=0.0			CI				INFERRED RESIDUAL SILTSTONE
				0.50	GA20-BH07/2002							
				11.90	DS 0.40-0.50 m			CH	Sandy CLAY			
					PID=0.0				medium plasticity, brown, fine grained sand			
					R = 0A							
				1.00	GA20-BH07/2003				Sandy CLAY	w < PL - w ~ PL	St	
			1	11.40	DS 0.90-1.00 m			CH	high plasticity, pale brown with orange, fine grained sand			
					PID=0.0				CLAY			
					R = 0A				high plasticity, orange and pale grey, trace fine grained sand			
				1.50	GA20-BH07/2004							
WB		100% Water RETURN		10.90	DS 1.40-1.50 m				orange and pale grey			
					PID=0.0							
					R = 0A							
			2		GA20-BH07-001						VSt	
					U63 1.50-1.90 m							
					PP = 400-450 kPa							
					GA20-BH07-002					w < PL		
			3		SPT 2.70-3.15 m							
					3, 4, 6							
					N=10						St - VSt	
					PP = 350->600 kPa							
			4		GA20-BH07-003							
					SPT 4.00-4.35 m						H	
				4.30	5, 10, 7/50mm HB							
									SILTSTONE			
									orange and pale grey, extremely weathered siltstone			
									For Continuation Refer to Sheet 2			
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA20-BH-HAW-07

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327564.3 m E 5810308.8 m N MGA94 55
SURFACE RL: 12.4 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.70 m

DRILL RIG: Comacchio Geo 305
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 31-8-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
				4	4.35		Continuation of Sheet 1					
NMLC	100% Water RETURN	100	0 (0)	5	8.05		SILTSTONE orange with pale grey	XW				
		100	0 (0)					XW - HW				
					5.40							
		100	75 (100)	6	7.00		orange brown	HW			5.55 m: DB 5.90 m: J, 10-15°, Un, Sm-Ro, FeO, SAND Sn-Ct, <3 mm 6.04 m: J, 0° 6.46-6.54 m: J, 60-70°, Pl, Sm, FeO, CLAY Sn-Ve 6.54 m: J, 0°, Pl, probably induced by drilling	
		100	65 (95)	7							7.33 m: J, 0°, Pl, Sm, hard CLAY Ct, <5 mm 7.34-7.42 m: Jmutiple, 80-90°, Pl, Sm, Cn, probably induced by drilling 7.54-7.57 m: IS, CLAY, <30 mm 7.58-7.65 m: IS, CLAY, <70 mm	
				8				HW - MW			7.93 m: J, 0-10°, Pl-Un, Sm, FeO Sn	
		100	35 (100)	9							8.33 m: J, 5°, Pl-Un, Sm, FeO Sn 8.35-8.44 m: J, 90°, Un, Sm-Ro, FeO Sn 8.44-8.80 m: JX5, 0-10°, sp = 50-110 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve 8.76 m: J, 20°, Pl, Sm-Ro, FeO Sn 8.81-8.96 m: JX3, 0-20°, sp = 60-80 mm, Pl-St, Sm, CLAY Ve, probably induced by drilling 9.03-9.58 m: JX2, 10°, sp = 550 mm, Pl, Sm, CLAY Ve	
				10							9.65-10.00 m: J, 80°, Pl, Sm, CLAY Ve	

REPORT OF BOREHOLE: GA20-BH-HAW-07

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327564.3 m E 5810308.8 m N MGA94 55
SURFACE RL: 12.4 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.70 m

DRILL RIG: Comacchio Geo 305
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 31-8-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	100	45 (85)	10	10.10 2.30		SILTSTONE orange with pale grey beddings dip 10 degrees	HW			10.09 m: DB 10.24-10.33 m: EWS, CLAY, GRAVEL, <100 mm 10.42-10.45 m: JX2, 0-10°, Pl-St, Sm, FeO Cn-Ve 10.53-10.62 m: EWS, CLAY, <100 mm 10.84 m: J, 10°, Un, Sm-Ro, SAND, GRAVEL Ct 11.03-11.06 m: P, 10-20°, Pl, Sm, FeO, SAND Sn-Ct 11.09-11.15 m: EWS, CLAY, <60 mm 11.41 m: J, 10°, Pl, Sm, FeO Sn 11.58-11.78 m: PX3, 10-20°, Pl, Sm-Ro, FeO, CLAY Sn-Ve 11.90-12.00 m: EWS, CLAY, SAND, <100 mm 12.04 m: J, 0°, Un, Sm, FeO Sn 12.27 m: J, 0-10°, Pl-Un, Sm, FeO, CLAY Sn-Ve 12.28-12.38 m: J, 70°, Pl, Sm, FeO, CLAY, SAND Sn-Ct 12.55-12.76 m: JX4, 10°, Pl-Un, Sm, FeO Cn-Sn 13.13 m: J, 0°, Un, Sm, FeO Sn 13.37 m: J, 0-10°, Pl-Un, Sm, CLAY Ve 13.48 m: J, 0-10°, Pl-Un, Sm, FeO Sn 13.93-13.97 m 14.06-14.09 m: JX2, 10°, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve 14.25-14.29 m: JX2, 0-5°, Pl, Sm, Cn 14.40 m: J, 0-30°, St, Sm, CLAY Ve 14.50-14.63 m: JX2, 0°, Pl, Sm, Cn	
				11				HW - MW				
								MW				
		100	25 (75)	12								
		100	45 (100)		12.85 -0.45		grey and pale brown	MW - SW				
		100	55 (100)	13								
				14	14.20 -1.80		grey	SW				
					14.70 -2.30		END OF BOREHOLE @ 14.70 m TARGET DEPTH GROUNDWATER NOT OBSERVED BACKFILLED					
				15								
				16								
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-08

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327602.9 m E 5810301.0 m N MGA94 55
SURFACE RL: 14.1 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.20 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 9-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M		0	14.10	GA20-BH-HAW-08/2001 DS 0.00-0.10 m PID=0.1 R = 1A GA20-BH-HAW-08/2002 DS 0.40-0.50 m PID=0.4 R = 1A			CI	FILL: Sandy CLAY medium plasticity, brown, fine to coarse grained sand, with fine to coarse grained, sub-angular to angualr gravel, trace, glass and wood fragments		F - St	INFERRED FILL
				0.90								
			1	13.20	GA20-BH-HAW-08/2003 DS 0.90-1.00 m PID=0.0 R = 0A			CH	CLAY high plasticity, yellow, pale grey			INFERRED RESIDUAL SILTSTONE
					GA20-BH-HAW-08/2004 DS 1.40-1.50 m PID=0.0 R = 0A GA20-BH08-001 SPT 1.50-1.95 m HW/150mm, 2, 5 N=7					w < PL	St	
			2									
			3	*3.00*								
WB		100% Water RETURN		11.00	GA20-BH08-002 SPT 3.00-3.45 m 4, 6, 9 N=15				pale grey, yellow with red, trace fine grained sand, trace fine to coarse grained, sub-rounded to sub-angular gravel		St - VSt	
				3.40					pale grey			
				10.70					with fine to medium grained sand			
				3.80								
NMLC			4	10.30	GA20-BH08-003 SPT 3.80-4.12 m 11, 18, 5/20mm HB				SILTSTONE pale grey, medium plasticity clay to extremely weathered siltstone	w < PL	H	
			5									
									For Continuation Refer to Sheet 2			
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA20-BH-HAW-08

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327602.9 m E 5810301.0 m N MGA94 55
SURFACE RL: 14.1 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.20 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 9-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
				4								
				5	5.18		Continuation of Sheet 1					
NMLC	100% Water RETURN	100	0 (30)		8.92		SILTSTONE pale brown	XW				
		100	0 (100)		5.85			XW - HW			5.45-5.50 m: DB 5.50-5.85 m: J, 90°, Pl, Sm, CLAY Ve 5.58 m: J, 0°, Un, Sm, SAND Ct 5.64-5.82 m: JX5, 0-5°, Pl-Un, Sm, CLAY, SAND Ve-Ct 5.82-5.85 m: CS, <30 mm, disturbed by drilling	
		60	0 (45)	6	6.00		CORE LOSS				6.00-6.04 m: CS, GRAVEL, <40 mm, disturbed by drilling	
		100	0 (125)		8.10		SILTSTONE brown with pale grey	HW			6.04-6.20 m: JX7, 0-30°, sp = 0-20 mm, Pl, Sm, FeO, CLAY Sn-Ve 6.20-6.65 m: Jmultiple, 0-90°, sp = 0-20 mm, Pl-Un, Sm, FeO, CLAY, SAND Sn-Ct	
		100	65 (100)	7	6.70 7.40		pale brown	HW - MW			6.85 m: J, 0°, Un, Sm, CLAY Ve 7.05-7.14 m: DB, <90 mm 7.50 m: DB	
		100	35 (100)	8							7.84 m: J, 0°, Un, Sm, CLAY Ve 7.90-8.00 m: J, 60°, Pl, Sm, CLAY Ve 8.06 m: J, 0°, Pl-Un, Sm, CLAY Ve 8.06-8.18 m: J, 60°, Pl, Sm, CLAY, SAND Ve-Ct 8.06 m: J, 0°, Pl-Un, Sm, CLAY Ve 8.15-8.30 m: J, 85°, Pl, Sm, FeO, CLAY Sn-Ve, disturbed by drilling 8.23 m: J, 0°, Pl-Un, Sm, CLAY Ve 8.30-8.33 m: JX2, 0-40°, sp = 0-30 mm, Pl, Sm, CLAY Ve 8.45 m: J, 40°, Pl, Sm, FeO Sn 8.62-8.92 m: JX4, 0-50°, sp = 60-130 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve 9.04-9.09 m: JX2, 0-70°, sp = 0-50 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve, disturbed by drilling 9.11 m: J, 0°, Pl-St, Sm, Cn 9.20-9.50 m: J, 90°, Pl, Sm, FeO, CLAY	
		100	20 (100)	9								
				10								

REPORT OF BOREHOLE: GA20-BH-HAW-08

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
COORDS: 327602.9 m E 5810301.0 m N MGA94 55
DRILL RIG: Comacchio Geo 205

PROJECT: Public Housing Renewal Project
SURFACE RL: 14.1 m DATUM: AHD
CONTRACTOR: Contract Drilling Services Pty Ltd

LOCATION: 1-7 Bills Street, Hawthorn
INCLINATION: -90° DIRECTION: 000°
LOGGED: SHZ DATE: 9-9-20

JOB NO: 20145767
HOLE DEPTH: 14.20 m
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	100	45 (100)	10			SILTSTONE brown with pale grey	MW			Sn-Ve 9.20-9.34 m: JX4, 0-10°, sp = -30-70 mm, Pl, Sm-Ro, FeO, SAND, CLAY Sn-Ct 9.20-9.50 m: J, 90°, Pl, Sm, FeO, CLAY Sn-Ve 9.40-9.45 m: JX2, 0-70°, sp = 0-50 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve, disturbed by drilling 9.48 m: J, 5°, Pl, Sm, FeO, CLAY Sn-Ve 9.70-9.95 m: JX2, 0-20°, sp = 250 mm, Pl-St, Sm, CLAY Ve 10.10-10.53 m: JX4, 25°, sp = 50-250 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve 10.75-10.79 m: JX3, 0-70°, sp = 0-50 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve, disturbed by drilling 10.87 m: J, 0°, Pl, Sm, FeO, CLAY Sn-Ve 11.06-11.33 m: JX3, 0-20°, sp = 70-200 mm, Pl, Sm, CLAY Ve 11.26 m: J, 0°, Pl, Sm, GRAVEL Ct, <10 mm 11.54-11.92 m: JX6, 0-20°, sp = 40-90 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve 12.10 m: JX2, 0°, sp = 10 mm, Pl, Sm, FeO, CLAY Sn-Ve 12.28-12.30 m: JX2, 0°, sp = 20 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve 12.48-12.59 m: JX2, 0°, sp = 110 mm, St, Sm, Cn 12.80 m: J, 5°, Pl-Un, Sm, CLAY Ve 13.04 m: J, 0°, Pl, Sm, CLAY Ve 13.25-13.72 m: JX7, 0-10°, sp = 50-200 mm, Pl, Sm, CLAY Ve 13.85-14.20 m: SZ <350 mm	
		100	45 (100)	11								
		100	45 (100)	12								
				13	13.00 1.10		brown grey					
		100	30 (100)		13.85 0.25		brown					
				14	14.20							
					-0.10		END OF BOREHOLE @ 14.20 m TARGET DEPTH GROUNDWATER NOT OBSERVED BACKFILLED					
				15								
				16								
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-09

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327635.2 m E 5810298.2 m N MGA94 55
SURFACE RL: 16.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 16.85 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 4-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	16.00	GA20-BH09/2001 DS 0.00-0.10 m PID=0.0 R = 1A GA20-BH09/2002 DS 0.40-0.50 m PID=0.1			CI	Sandy CLAY medium plasticity, brown, fine to coarse grained sand, with fine to coarse grained, sub-angular to angular gravel, trace roots, glass, wood fragments	w < PL w < PL - w ~ PL	F - St	INFERRED FILL
				0.80								
			1	15.20	R = 1A GA20-BH09/2003 DS 0.90-1.00 m PID=0.0 R = 0A			CH	CLAY high plasticity, grey with orange			INFERRED RESIDUAL SILTSTONE
				1.40								
				14.60	GA20-BH09-001 SPT 1.00-1.45 m 3, 4, 6 N=10				orange and grey		St	
			2		GA20-BH09/2004 DS 1.40-1.50 m PID=0.0 R = 0A							
				2.50								
WB	L-M			13.50	GA20-BH09-002 SPT 2.50-2.95 m 4, 7, 10 N=17			CH	Sandy CLAY high plasticity, pale grey with orange, fine to medium grained sand, with fine grained gravel	w < PL		
			3									
				4.00								
			4	12.00	GA20-BH09-003 SPT 4.00-4.45 m 6, 12, 18 N=30			CH	CLAY high plasticity, orange and pale grey, trace fine to coarse grained sand, trace fine grained, dub-rounded to sub-angular gravel		VSt	
				4.50								
NMLC				11.50					trace fine to coarse grained sand, trace fine to coarse grained, dub-rounded to sub-angular gravel			
			5									
				5.50								
				10.50	GA20-BH09-004 SPT 5.50-5.95 m 3, 4, 6 N=10				trace fine grained sand, trace fine to medium grained, sub-rounded to sub-angular gravel	w < PL - w ~ PL	St	
				5.90								
			6	10.10					pale grey and orange with grey, with fine grained sand	w < PL		
				7.00								
			7	9.00	GA20-BH09-005 SPT 7.00-7.30 m 12, 18/150mm HB				SILTSTONE pale grey, medium plasticity clay to extremely weathered siltstone		H	
									For Continuation Refer to Sheet 2			
			8									
			9									
			10									

REPORT OF BOREHOLE: GA20-BH-HAW-09

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327635.2 m E 5810298.2 m N MGA94 55
SURFACE RL: 16.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 16.85 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 4-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
				4								
				5								
				6								
				7								
					7.34		Continuation of Sheet 1					
NMLC	100% Water RETURN	100	0 (0)		8.66		SILTSTONE/BRECCIA pale grey and orange and brown, recovered as coarse sand to sub-angular gravel sized clasts of siltstone in a clay matrix	XW				
				8	8.00							
		90	0 (35)		7.94		CORE LOSS					
							SILTSTONE/BRECCIA pale grey and orange and brown, recovered as coarse sand to sub-angular gravel sized clasts of siltstone in a clay matrix	XW - HW			8.23-8.31 m: J, 80°, Pl, Sm, CLAY Cn-Ve 8.29 m: DB 8.33 m: J, 0°, Pl, Sm, FeO, SAND Sn-Ct 8.38 m: DB 8.41-8.56 m: EWS, SAND, GRAVEL, <150 mm 8.55-8.62 m: P, 80°, Pl-Un, Sm, SAND Ve-Ct, disturbed by drilling 8.65-8.70 m: EWS, CLAY, SAND, <50 mm 8.90-9.00 m: HB 9.00-9.13 m: CS, SAND, GRAVEL, <130 mm 9.15-9.50 m: P, 80-85°, sp = 0-120 mm, Pl, Sm, SAND Cn-Ct, disturbed by drilling 9.27-9.30 m: EWS, 0°, Pl, Sm-Ro, SAND,	
					8.70							
					7.30		CORE LOSS					
					8.90							
		80	0 (45)	9	7.10		SILTSTONE/BRECCIA pale grey and orange, angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW				
		100	0 (75)	10								

REPORT OF BOREHOLE: GA20-BH-HAW-09

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327635.2 m E 5810298.2 m N MGA94 55
SURFACE RL: 16.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 16.85 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 4-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	100	0 (75)	10	10.70		SILTSTONE/BRECCIA pale grey and orange, angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW			GRAVEL Ct, <10 mm 9.51-9.64 m: Jmultiple, 0-90°, sp = 0-50 mm, Pl, Sm-Ro, FeO Sn 9.65-9.70 m: EWS, CLAY, <50 mm 9.70-9.76 m: DB 9.83 m: J, 5°, Un, Sm, CLAY Ve	
					10.85		CORE LOSS				9.95-10.03 m: EWS, CLAY, SAND, <80 mm 10.05-10.45 m: Jmultiple, 0-90°, sp = 0-50 mm, Pl, Sm, Cn 10.10 m: DB 10.50 m: J, 70°, Pl, Sm, SAND Ct, <20 mm 10.55-10.70 m: EWS, CLAY, SAND, GRAVEL, <150 mm 10.86-10.90 m: EWS, CLAY, SAND, <50 mm 10.90-11.00 m: DB 11.40-11.60 m: CS, <200 mm, disturbed by drilling 11.60-11.66 m: EWS, CLAY, GRAVEL 11.70-11.83 m: JX4, 0-10°, sp = 10-50 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve 11.73-11.92 m: Jmultiple, 70°, sp = 0-80 mm, Pl, Sm, CLAY, SAND, GRAVEL Ve-Ct, some disturbed by drilling 11.95-12.00 m: JX4, 0-80°, sp = 0-20 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve 12.05-12.20 m: Jmultiple, 10-85°, sp = 0-10 mm, Pl, Sm-Ro, FeO Sn 12.24-12.36 m: JX3, 60-70°, sp = 30-80 mm, Pl-Un, Sm, SAND, GRAVEL Ct, disturbed by drilling 12.38-12.50 m: Jmultiple, 0-90°, sp = 0-30 mm, Pl-Un, Sm-Ro, CLAY, SAND Ve-Ct 12.50-12.54 m: EWS, CLAY, <50 mm 12.55-12.69 m: Jmultiple, 0-30°, sp = 0-40 mm, Pl-Un, Sm-Ro, FeO, SAND, GRAVEL Sn-Ct 12.63-12.71 m: EWS, SAND, CLAY, <80 mm 12.71-12.80 m: J, 85°, Pl, Sm-Ro, SAND Ct 12.72-12.80 m: JX3, 0-20°, sp = 20-30 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve 13.00-13.05 m: CS, SAND, GRAVEL, <50 mm 13.05-13.10 m: Jmultiple, 0-90°, sp = 0-30 mm, Pl-Un, Sm-Ro, FeO Sn 13.18-13.44 m: Jmultiple, 0-20°, sp = 0-50 mm, Pl, Sm-Ro, FeO Sn 13.18-13.30 m: EWS, CLAY, SAND, <120 mm 13.18-13.44 m: Jmultiple, 0-20°, sp = 0-50 mm, Pl, Sm-Ro, FeO Sn 13.38-13.50 m: EWS, CLAY, SAND, <120 mm 13.60-13.63 m: CS 13.70 m: J, 0°, Pl-Un, Sm-Ro, SAND Ct, <20 mm 13.72-13.80 m: Jmultiple, 0-60°, sp = 0-20 mm, Pl, Sm-Ro, FeO Sn 13.81-13.90 m: EWS, CLAY, SAND, <100 mm 13.92-13.97 m: Jmultiple, 0-60°, sp = 0-30 mm, Pl-Un, Sm-Ro, FeO, SAND Sn-Ct 14.00-14.08 m: J, 85°, Pl-Un, Sm, SAND Ct 14.08-14.20 m: EWS, CLAY, SAND, <120 mm 14.25-14.75 m: CS, <500 mm, disturbed by drilling 14.70-14.90 m: J, 85°, Pl-Un, Sm, CLAY, SAND Ve-Ct 14.92-14.97 m: JX3, 0-70°, sp = 0-20 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve 14.98-15.07 m: EWS, CLAY, SAND, <90 mm 15.25-15.35 m: JX3, 90°, sp = 0-20 mm, Pl, Sm, Cn 15.35-15.40 m: <50 mm 15.40-15.55 m: CS, SAND, GRAVEL, <150 mm 15.60-16.00 m: Pmultiple, 80-90°, sp = 0-20 mm, Pl-Un, Sm, FeO, CLAY Sn-Ve 15.75 m: J, 0°, Un, Sm, FeO, SAND Sn-Ct 15.85-16.00 m: EWS, CLAY, SAND, <50 mm 16.00-16.15 m: CS, FeO Sn, disturbed by drilling 16.20-16.25 m: Jmultiple, 80-90°, sp = 0-20 mm, Pl, Sm, CLAY Cn-Ve, disturbed	
					11.60							
		100	0 (60)		12.50		SILTSTONE pale grey and orange	HW - MW				
		100	0 (75)		12.80			XW - HW				
					13.00		SILTSTONE/BRECCIA angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass					
		70	0 (20)	13	13.50		CORE LOSS SILTSTONE/BRECCIA angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW				
		85	0 (45)		15.07		CORE LOSS SILTSTONE/BRECCIA angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - MW				
		100	0 (50)	14								
		100	0 (55)									
		85	0	15	15.25		CORE LOSS					
					16.85		SILTSTONE/BRECCIA angular gravel sized siltstone clasts within a weathered clay to extremely weathered siltstone mass	XW - HW				
		100	0	16								
				17	-0.85		END OF BOREHOLE @ 16.85 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 5.20 m DEPTH STANDPIPE INSTALLED					
				18								
				19								
				20								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F02a RL3

REPORT OF BOREHOLE: GA20-BH-HAW-09

SHEET: 4 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327635.2 m E 5810298.2 m N MGA94 55
SURFACE RL: 16.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 16.85 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 4-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	*DEPTH* RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				20							by drilling 16.25 m 16.25-16.65 m: JX4, 0°, sp = 100-150 mm, Un, Sm, SAND, fine GRAVEL Ct 16.25 m 16.25-16.65 m: JX4, 0°, sp = 100-150 mm, Un, Sm, SAND, fine GRAVEL Ct 16.45-16.70 m: EWS, CLAY, SAND, GRAVEL, <150 mm 16.72 m: J, 60°, Pl, Sm, CLAY Cn-Ve 16.75-16.85 m: EWS, CLAY, SAND, GRAVEL, <100 mm	
				21								
				22								
				23								
				24								
				25								
				26								
				27								
				28								
				29								
				30								

REPORT OF BOREHOLE: GA20-BH-HAW-10

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327562.5 m E 5810276.2 m N MGA94 55
SURFACE RL: 11.5 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.50 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 22-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M		0	11.50	GA20-BH-HAW-10/200 DS 0.00-0.10 m PID=0.4 R = 1A			CL-CI	Sandy CLAY low - medium plasticity, brown, fine to coarse grained sand			INFERRED FILL
				0.50						w < PL		
				11.00	GA20-BH-HAW-10/2002 DS 0.40-0.50 m PID=0.0 R = 1A			CI	CLAY medium plasticity, brown, yellow, pale grey, with fine to coarse grained sand, trace fine to coarse grained, sub-angular gravel, trace brick and wood fragments			
			1	1.00	GA20-BH-HAW-10/200						F - St	
				10.50	DS 0.90-1.00 m PID=0.1 R = 1A				brown, black, orange, trace fine to coarse grained sand, trace fine to medium grained, sub-angualr gravel	w < PL - w ~ PL		
				1.50	GA20-BH-HAW-10/200							
				10.00	DS 1.40-1.50 m PID=0.0 R = 1A				red, yellow, brown, black, trace fine to coarse grained sand, trace fine to coarse grained, sub-rounded to sub-angular gravel			
			2		GA20-BH10-2001 SPT 2.00-2.45 m 5, 6, 3 N=9					w < PL	St	
				2.50								
				9.00					plastic, metal fragments			
				2.80								
				8.70				CI-CH	CLAY medium - high plasticity, brown grey, with fine grained sand	w < PL - w ~ PL		INFERRED RESIDUAL SILTSTONE
			3	3.20								
				8.30	GA20-BH10-002 U63 3.20-3.60 m PP = 550->600 kPa			CH	CLAY high plasticity, orange and grey		VSt - H	
WB			4									
				4.50								
				7.00	GA20-BH10-003 SPT 4.50-4.95 m 3, 5, 12 N=17				orange with grey	w < PL		
			5								VSt	
			6	6.00								
				5.50					SILTSTONE pale grey and orange, medium plasticity clay to extremely weathered siltstone		H	
									For Continuation Refer to Sheet 2			
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01a RL3

REPORT OF BOREHOLE: GA20-BH-HAW-10

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327562.5 m E 5810276.2 m N MGA94 55
SURFACE RL: 11.5 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.50 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 22-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
				4								
				5								
				6								
					6.20		Continuation of Sheet 1					
NMLC	100% Water RETURN	100	70 (100)	7	5.30		SILTSTONE grey brown	HW - MW			6.30-6.70 m: JX3, 0°, sp = 160-220 mm, Pl, Sm-Ro, FeO Sn	
		100	100 (100)									
		100	0 (100)								7.03 m: J, 0°, Un, Sm, CLAY Ve	
		100	75 (100)	8							7.20 m: J, 0°, Pl, Sm-Ro, FeO, calcite Sn 7.22-7.28 m: JX2, 0°, sp = 20 mm, Pl, Sm-Ro, FeO Sn 7.35 m: J, 30°, Pl, Sm-Ro, FeO Sn 7.43 m: J, 0°, Pl, Sm-Ro, FeO Sn	
											7.93 m: J, 0°, Pl, Sm-Ro, FeO Sn	
					8.50						8.23 m: J, 40°, Cv, Sm-Ro, FeO Sn 8.40 m: J, 65°, Pl, Sm-Ro, FeO Sn	
					3.00		brown grey	MW				
		100	80 (100)	9								
				10								

REPORT OF BOREHOLE: GA20-BH-HAW-10

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
COORDS: 327562.5 m E 5810276.2 m N MGA94 55
DRILL RIG: Comacchio Geo 205

PROJECT: Public Housing Renewal Project
SURFACE RL: 11.5 m DATUM: AHD
CONTRACTOR: Contract Drilling Services Pty Ltd

LOCATION: 1-7 Bills Street, Hawthorn
INCLINATION: -90° DIRECTION: 000°
LOGGED: SHZ DATE: 22-9-20

JOB NO: 20145767
HOLE DEPTH: 14.50 m
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	100	80 (100)	10			SILTSTONE grey brown	MW			9.92 m: J, 0°, Pl, Sm-Ro, FeO Sn 10.00-10.04 m: CS, <40 mm, disturbed by drilling 10.04-10.10 m: J, 90°, Pl, Sm-Ro, FeO, CLAY Sn-Ve 10.10-10.12 m: CS, <20 mm 10.27 m: J, 5°, Pl, Sm-Ro, FeO Sn 10.47-10.50 m: JX2, 0-15°, sp = 0-30 mm, Pl, Sm-Ro, FeO Sn, drilling induced opening	
				11							11.18 m: J, 30°, Pl, Sm, CLAY Ve 11.38-11.39 m: JX2, 0°, sp = 2-10 mm, Pl, Sm-Ro, FeO, CLAY Sn-Ve	
					11.45 0.05		dark grey with brown	MW - SW				
		100	70 (100)	12							11.87 m: J, 15°, Pl, Sm-Ro, FeO Sn 12.04 m: J, 10°, Pl-Un, Sm-Ro, FeO Sn 1 12.42 m: J, 15°, Pl-Un, Sm, Cn 12.66 m: J, 0°, Pl, Sm, FeO Sn 12.72-12.90 m: J, 80°, Pl, Sm, CLAY Cn-Ve, disturbed by drilling	
		100	65 (100)	13							13.19 m: J, 0°, Pl, Sm, SAND Ct 13.25-13.28 m: JX5, 0°, sp = 0-5 mm, Pl-St, Sm, FeO, GRAVEL Sn-Ct 13.38-13.43 m: JX2, 0°, sp = 50 mm, Pl, Sm, CLAY Ve 13.38-13.50 m: J, 70°, Pl, Sm, CLAY Cn-Ve 13.38-13.43 m: JX2, 0°, sp = 50 mm, Pl, Sm, CLAY Ve 13.38-13.50 m: J, 70°, Pl, Sm, CLAY Cn-Ve 13.77 m: J, 10°, Pl, Sm, FeO, CLAY Sn-Ve	
				14	*14.50* -3.00						14.39-14.50 m: CS, disturbed by drilling	
							END OF BOREHOLE @ 14.50 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 5.10 m DEPTH STANDPIPE INSTALLED					
				15								
				16								
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-11

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327599.0 m E 5810276.5 m N MGA94 55
SURFACE RL: 12.5 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.52 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 11-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M		0	12.50	GA20-BH-HAW-11/2001 DS 0.00-0.10 m PID=0.3 R = 1A			CI	Sandy CLAY medium plasticity, brown, dark brown, fine to coare grained sand, trace fine to coarse grined gravel, sub-angular to angular			INFERRED FILL
				0.50	GA20-BH-HAW-11/2002							
				12.00	DS 0.40-0.50 m PID=0.2 R = 1A			CI-CH	CLAY medium - high plasticity, pale grey, brown, grey, orange, with fine to coarse grained sand			
			1	*1.00*	GA20-BH-HAW-11/2003 DS 0.90-1.00 m PID=0.1 R = 1A					w < PL	St - VSt	
				11.50					brown with orange and pale grey			
				1.50	GA20-BH-HAW-11/2004 DS 1.40-1.50 m PID=0.1 R = 1A							
				11.00					orange and pale grey with brown, trace fine to medium grained sand, with fine to coarse grained, sub-angular gravel			
			2	*2.00*	GA20-BH11-001 SPT 1.50-1.95 m 11, 15, 14 N=29							
				10.50					SILTSTONE pale grey, yellow, medium plasticity clay to extremely weathered siltstone	w < PL	VSt - H	
					GA20-BH-HAW-11/2005 -BH11-002 R = 0A SPT 2.75-2.80 m 5/50mm HB							
			3						For Continuation Refer to Sheet 2			
			4									
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA20-BH-HAW-11

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327599.0 m E 5810276.5 m N MGA94 55
SURFACE RL: 12.5 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.52 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 11-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
					2.87		Continuation of Sheet 1					
NMLC	100% Water RETURN	100	45 (100)	3	9.63		SILTSTONE pale brown, bedding indiscernible	HW			3.14-3.20 m: CS, FeO, CLAY Sn-Ve, probably induced and disturbed by drilling 3.28 m: DB 3.40 m: DB	
		85	0 (40)		3.50 3.60 8.90		CORE LOSS SILTSTONE pale brown with pale grey	XW				
		95	0 (95)	4	4.05 4.16 8.34		CORE LOSS SILTSTONE pale brown, bedding at approximately 80 to 90 degrees, Iron oxide	HW			4.16-5.70 m: JX2, 80-90°, sp = 0-60 mm, Pl-Un, Sm-Ro, FeO Cn-Sn 4.27-5.70 m: Jmultiple, 0-10°, sp = 5-200 mm, Pl-St, Sm, FeO, CLAY Sn-Ve, some disturbed and opened by drilling	
		105	55 (105)	5	5.80 6.70		pale grey with pale brown, Iron oxide				5.77-5.80 m: JX2, 0°, sp = 30 mm, Pl, Sm, CLAY Ve 6.05 m: J, 30°, Pl-Un, Sm, CLAY Ve 6.11-6.21 m: JX2, 0°, Pl, Sm, Cn 6.29 m: J, 0°, Pl-Un, Sm-Ro, FeO Sn	
		100	65 (100)	6	7.80 4.70		pale brown, Iron oxide				6.84-7.00 m: JX3, 0°, sp = 20-90 mm, Pl-Un, Sm-Ro, FeO Sn 7.02 m: J, 0°, Pl-Un, Sm-Ro, FeO Sn 7.81 m: J, 0°, Pl, Sm, CLAY Ve 7.93-8.06 m: J, 70°, Un, Ro, FeO, SAND Sn-Ct 8.25-9.00 m: J, 80-90°, Pl-Un, Sm, CLAY Cn-Ve 8.60-8.86 m: JX5, 0-10°, Un, Sm-Ro, FeO, CLAY Sn-Ve 8.70-8.80 m: J, 80°, Un, Sm-Ro, FeO, SAND Sn-Ct 9.00-9.80 m: J, 85°, Pl-Un, Sm, CLAY Cn-Ve 9.10-9.81 m: JX8, 0-5°, sp = 30-200 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve	
		100	15 (100)	7 8 9 10								

REPORT OF BOREHOLE: GA20-BH-HAW-11

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327599.0 m E 5810276.5 m N MGA94 55
SURFACE RL: 12.5 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 14.52 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 11-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	100% Water RETURN	100	0 (90)	10			SILTSTONE pale brown, bedding at approximately 80 to 90 degrees, Iron oxide	HW			9.97 m: J, 30°, Pl, Sm, CLAY Ve 10.10-10.73 m: JX9, 0-10°, sp = 30-150 mm, Pl-Un, Sm-Ro, FeO, CLAY, SAND Sn-Ct	
				11							10.81-10.89 m: JX5, 0-80°, sp = 0-40 mm, Pl, Sm, CLAY Ve 11.00-11.25 m: J, 85°, Pl-Un, Sm, CLAY Ve 11.08-11.32 m: J4, 0°, sp = 40-100 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve 11.34-11.48 m: EWS, CLAY, SAND, <140 mm	
					11.50 1.00		brown with brown grey	MW			11.54 m: J, 70°, Pl, Sm, CLAY, SAND Ve-Ct, disturbed by drilling 11.80 m: J, 0-10°, Un, Sm-Ro, FeO, CLAY, SAND, GRAVEL Ve-Ct, <20 mm, disturbed by drilling	
		100	25 (100)	12							11.93 m: J, 0°, Pl, Sm-Ro, FeO Sn 12.20-12.33 m: JX2, 30°, sp = 130 mm, Pl, Sm-Ro, FeO, SAND Sn-Ct 12.23-13.00 m: J, 90°, Pl-Un, Sm, CLAY Cn-Ve 12.48-12.94 m: JX3, 0°, Pl-St, Sm-Ro, FeO, CLAY Sn-Ve	
				13							13.14-13.40 m: JX2, 0-5°, sp = 250 mm, Pl-Un, Sm, FeO Cn-Sn	
		100	70 (100)								13.70 m: J, 0°, St, Sm, Cn 13.80 m: J, 0°, Pl, Sm, CLAY Ve 13.88 m: JX2, 0-80°, sp = 0-40 mm, Pl-Un, Sm-Ro, FeO, CLAY, SAND Sn-Ct 13.97 m: J, 0°, Pl-St, Sm, CLAY Ve 14.21 m: J, 5°, Pl, Sm, FeO Sn	
				14	*14.52* -2.02		END OF BOREHOLE @ 14.52 m TARGET DEPTH GROUNDWATER NOT OBSERVED BACKFILLED					
				15								
				16								
				17								
				18								
				19								
				20								

REPORT OF BOREHOLE: GA20-BH-HAW-12

SHEET: 1 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327649.7 m E 5810276.0 m N MGA94 55
SURFACE RL: 15.9 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 17.20 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 14-9-20
CHECKED: PGS DATE: 20-10-20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	15.90	GA20-BH-HAW-12/2001 DS 0.00-0.10 m PID=0.0 R = 2A			CL-CI	Gravelly Sandy CLAY low - medium plasticity, brown, fine to coarse grained sand, fine to coarse grained, sub-angular to angular gravel			INFERRED FILL
				0.50	GA20-BH-HAW-12/2002/2802/2902 DS 0.40-0.50 m PID=0.0 R = 1A				trace glass, brick, wood fragments			
			1	1.00 14.90	GA20-BH-HAW-12/2003 DS 0.90-1.00 m PID=0.1 R = 1A			CI	CLAY medium plasticity, brown with orange and yellow and pale grey, trace fine to coarse grained sand	w < PL	F - St	
			2		GA20-BH-HAW-12/2004 DS 1.40-1.50 m PID=0.0 R = 1A							
				2.50 13.40	GA20-BH12-001 SPT 2.50-2.95 m 2, 1, 1 N=2				grey and orange		S	
			3	3.80 12.10				CL	Sandy CLAY low plasticity, brown, grey, fine grained sand	w < PL - w ~ PL	St - VSt	INFERRED RESIDUAL SILTSTONE
WB	L-M		4		GA20-BH12-002 U63 4.00-4.40 m PP = 150-250 kPa							
		100% Water RETURN	5	5.50 10.40	GA20-BH12-003 SPT 5.50-5.95 m 3, 3, 5 N=8			CH	CLAY high plasticity, orange and pale grey with grey, trace fine to medium grained, rounded sand	w < PL	St	
NMLC			6									
			7	7.00 8.90	GA20-BH12-004 SPT 7.00-7.45 m 4, 6, 7 N=13				orange and pale grey			
		0% Water RETURN	8						For Continuation Refer to Sheet 2			
			9									
			10									

REPORT OF BOREHOLE: GA20-BH-HAW-12

SHEET: 2 OF 3

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327649.7 m E 5810276.0 m N MGA94 55
SURFACE RL: 15.9 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 17.20 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 14-9-20
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0								
				1								
				2								
				3								
				4								
				5								
				6								
				7								
				8	8.00		Continuation of Sheet 1					
NMLC	0% Water RETURN	85	0 (85)		7.85		CORE LOSS SILTSTONE pale grey and orange with brown	HW			8.05-8.40 m: Jmultiple, 0-90°, sp = 0-30 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve, disturbed by drilling	
					8.40							
		80	0 (10)		7.40		CORE LOSS SILTSTONE/BRECCIA orange brown with grey and brown, coarse sand to sub-angular to angular gravel sized clasts of siltstone in a clay to extremely weathered siltstone matrix	XW - HW			8.50-8.60 m: CS, GRAVEL, SAND, <100 mm 8.67-8.77 m: CS, GRAVEL, SAND, <100 mm	
				9	9.00							
	0% Water RETURN	100	15 (85)		6.90			HW			8.80-8.85 m: CS, GRAVEL, SAND, <50 mm 8.85-8.90 m: IS, CLAY, <50 mm 8.90-9.23 m: Jmultiple, 0-60°, sp = 0-20 mm, Pl, Sm-Ro, FeO Cn-Sn 9.24-9.38 m: P, 50°, sp = 0-40 mm, Pl, Sm, FeO, CLAY, GRAVEL Cn-Ct 9.38-9.48 m: EWS, <100 mm 9.60-9.75 m: JX2, 40°, sp = 150 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve	
					9.48		SILTSTONE orange brown with grey and brown					
	50% Water RETURN	90	15 (70)		6.35		CORE LOSS SILTSTONE grey brown with brown	HW - MW				
				10								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F02a RL3

REPORT OF BOREHOLE: GA20-BH-HAW-12

SHEET: 3 OF 3

CLIENT: Hayball Pty Ltd
COORDS: 327649.7 m E 5810276.0 m N MGA94 55
DRILL RIG: Comacchio Geo 205

PROJECT: Public Housing Renewal Project
SURFACE RL: 15.9 m DATUM: AHD
CONTRACTOR: Contract Drilling Services Pty Ltd

LOCATION: 1-7 Bills Street, Hawthorn
INCLINATION: -90° DIRECTION: 000°
LOGGED: SHZ DATE: 14-9-20

JOB NO: 20145767
HOLE DEPTH: 17.20 m
CHECKED: PGS DATE: 20-10-20

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	50% Water RETURN			10	10.10						9.86 m: J, 70°, Pl, Sm-Ro, FeO Sn 9.91-9.91 m: JX2, 45°, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ct	
					10.28		CORE LOSS					
		75	0 (55)		5.62 10.70		SILTSTONE orange brown with pale brown	XW - HW			9.94-10.04 m: EWS, CLAY, <100 mm 10.38-10.43 m: JX2, 0-10°, sp = 50 mm, Pl-Un, Sm, GRAVEL, SAND Ct, <10 mm, drilling induced opening 10.47-10.57 m: J, 70°, Pl, Sm, CLAY, SAND Ct 10.68 m: J, 0°, Pl, Sm, Cn	
		100	0 (0)	11	5.20 11.83		SILTSTONE/BRECCIA pale grey with orange, coarse sand to sub-angular to angular gravel inclusions in extremely weathered siltstone matrix	XW				
		100	10 (90)	12	4.07		SILTSTONE	HW HW - MW			11.83-12.00 m: Jmultiple, 0-85°, sp = 0-20 mm, Pl, Sm, CLAY, SAND Ve-Ct 12.00-12.10 m: IS, CLAY, <100 mm 12.13-12.70 m: Jmultiple, 0-15°, sp = 0-140 mm, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve	
		100	10 (100)	13				XW - HW			12.88-13.30 m: JX7, 0°, Un, Sm, CLAY, SAND Ve-Ct	
		100	25 (100)	14				HW			13.45-13.58 m: JX5, 70-90°, sp = 0-80 mm, Pl-Un, Sm, CLAY, SAND, fine GRAVEL Ct 13.66-13.72 m: J, 70°, Pl, Sm, CLAY, SAND Ct, <3 mm 13.76 m: DB 13.86 m: JX2, 0-80°, sp = 0-40 mm, Pl-Un, Sm-Ro, FeO Sn 13.94 m: J, 30°, Pl, Sm, CLAY Ve 14.08 m: J, 60°, Pl-Un, Sm-Ro, FeO, CLAY Sn-Ve 14.30 m: J, 60°, Pl, Ro, SAND Ct, <2 mm 14.51-14.65 m: J, 80°, Pl, Sm, CLAY Ve 14.75 m: J, 60°, Pl, Sm, CLAY Ve	
		100	35 (100)	15				XW - HW			15.06-15.12 m: JX2, 5-60°, sp = 10-80 mm, Pl-Un, Sm, CLAY Ve 15.21-15.30 m: J, 10-80°, sp = 0-110 mm, Un, Sm-Ro, FeO, SAND, GRAVEL Sn-Ct 15.51 m: J, 30°, Pl-Un, Sm, FeO, SAND Sn-Ct 15.60 m: J, 10°, Pl, Sm, CLAY Ve 15.74 m: J, 5°, Un, Sm, CLAY Ve 15.87 m: J, 0°, Pl-Un, Sm, Cn 15.94 m: J, 20°, Pl-Un, Sm-Ro, FeO Sn 16.16-16.22 m: CS, <60 mm	
		100	20 (95)	16	16.00 -0.10 16.30 -0.40 16.80 -0.90 17.20		pale grey orange brown with pale grey dark grey	HW			16.41-16.53 m: J, 0-10°, sp = 30-100 mm, Un, Sm-Ro, FeO, SAND, GRAVEL Sn-Ct 16.61-16.66 m: CS, SAND, GRAVEL, <50 mm 16.74-16.87 m: J, 80°, Pl, Sm, CLAY Cn-Ve	
				17	-1.30		END OF BOREHOLE @ 17.20 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 4.30 m DEPTH STANDPIPE INSTALLED				17.03 m: J, 0°, Un, Sm, Cn 17.06-17.15 m: J, 70°, Pl-Un, Sm, SAND, GRAVEL Ct	
				18								
				19								
				20								

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE & TEST PIT REPORTS

DRILLING/EXCAVATION METHOD

ADH	Hollow auger drilling	EX	Excavator	PQ3	Diamond core - 83 mm
ADT	Auger drilling with tc-bit	HA	Hand auger	PT	Push tube sampling
ADV	Auger drilling with v-bit	HAND	Excavated by hand methods	RAB	Rotary air blast
AIRCORE	Aircore	HMLC	Diamond core - 63 mm	RC	Reverse circulation
AT	Air track	HQ3	Diamond core - 61 mm	RT	Rock roller
BH	Backhoe bucket	JET	Jetting	SONIC	Sonic drilling
CT	Cable tool rig	MZ	Mazier tube sampling	SPT	Standard penetration testing
DTC	Diatube coring	NDD	Non-destructive digging	U	Undisturbed tube sampling
EE	Existing excavation	NMLC	Diamond core - 52 mm	WB	Washbore drilling
EPT	Extruded push tube	NQ3	Diamond core - 45 mm		

PENETRATION/EXCAVATION RESISTANCE

L **Low resistance.** Rapid penetration possible with little effort from the equipment used.

M **Medium resistance.** Excavation/possible at an acceptable rate with moderate effort from the equipment used.

H **High resistance** to penetration/excavation. Further penetration is possible at a slow rate and requires significant effort from the equipment.

R **Refusal or Practical Refusal.** No further progress possible without the risk of damage or unacceptable wear to the digging implement or machine.

These assessments are subjective and are dependent on many factors including the equipment power, weight, condition of excavation or drilling tools, and the experience of the operator.

WATER

	Water level at date shown		Partial water loss
	Water inflow		Complete water loss

GROUNDWATER NOT OBSERVED — The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.

GROUNDWATER NOT ENCOUNTERED — The borehole/test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following 150mm seating
30/80 mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
DS	Disturbed sample
BDS	Bulk disturbed sample
G	Gas Sample
W	Water Sample
FP	Field permeability test over section noted
FV	Field vane shear test expressed as uncorrected shear strength (s_v = peak value, s_r = residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket penetrometer test expressed as instrument reading in kPa
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres
WPT	Water pressure test
DCP	Dynamic cone penetration test
CPT	Cone penetration test
CPTu	Cone penetration test with pore pressure (u) measurement

RANKING OF VISUALLY OBSERVABLE CONTAMINATION AND ODOUR (for specific soil contamination assessment projects)

R = 0	No visible evidence of contamination	R = A	No non-natural odours identified
R = 1	Slight evidence of visible contamination	R = B	Slight non-natural odours identified
R = 2	Visible contamination	R = C	Moderate non-natural odours identified
R = 3	Significant visible contamination	R = D	Strong non-natural odours identified

ROCK CORE RECOVERY

TCR = Total Core Recovery (%)	RQD = Rock Quality Designation (%)	SCR = Solid Core Recovery (%)	F = Fracture Frequency
$\frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100$	$\frac{\text{Axial lengths of core} \geq 100\text{ mm}}{\text{Length of core run}} \times 100$	$\frac{\text{Length of cyclindrical core recovered}}{\text{Length of core run}} \times 100$	$\frac{\text{No. of defects}}{\text{Length of zone (m)}}$

METHOD OF SOIL DESCRIPTION USED ON BOREHOLD & TEST PIT REPORTS

SYMBOLS

FILL

GRAVEL (GW, GP, GM or GC)

SAND (SW, SP, SM or SC)

SILT (ML or MH)

CLAY (CL, CI or CH)

ORGANIC SOILS (OL, OH or Pt)

COBBLES or BOULDERS

Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay.

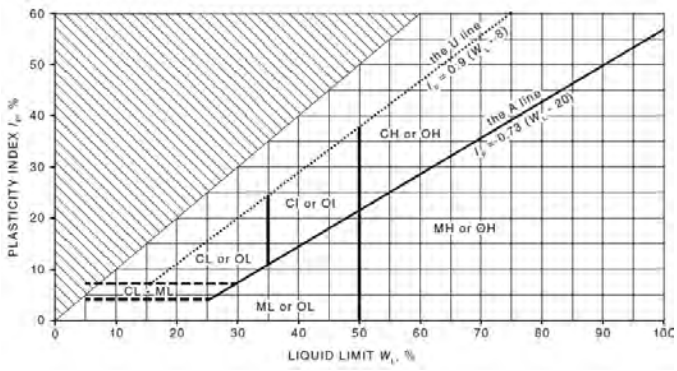
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil and Rock is classified and described in Reports of Boreholes and Test Pits using the preferred method given in AS1726-2017. The material properties are assessed in the field by visual/tactile methods.

Particle Size

Soil Group	Sub Division	Particle Size
BOULDERS		> 200 mm
COBBLES		63 to 200 mm
GRAVEL	Coarse	19 to 63 mm
	Medium	6.7 to 19 mm
	Fine	2.36 to 6.7 mm
SAND	Coarse	0.6 to 2.36 mm
	Medium	0.21 to 0.6 mm
	Fine	0.075 to 0.21 mm
SILT		0.002 to 0.075 mm
CLAY		< 0.002 mm

Plasticity Properties



MOISTURE CONDITION

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays and silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in dry condition and may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sand and gravels tend to cohere.

Moisture condition for fine grained soils is described relative to the plastic limit or liquid limit as specified in AS1726-2017.

CONSISTENCY AND DENSITY

Fine Grained Soils

Symbol	Term	Undrained Shear Strength
VS	Very Soft	0 to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	Above 200 kPa
Fr	Friable	-

Coarse Grained Soils

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

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.

* SPT correlations are not stated in AS1726-2017, and may be subject to corrections for overburden pressure and equipment type.

CEMENTATION

Weakly Cemented	The soil may be easily disaggregated by hand in air or water.
Moderately Cemented	Effort is required to disaggregate the soil by hand in air or water.

TERMS FOR ROCK MATERIAL STRENGTH & WEATHERING AND ABBREVIATIONS FOR DEFECT DESCRIPTIONS

STRENGTH

Symbol	Term	UCS (MPa)	Field Guide
VL	Very Low	0.6 to 2	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	2 to 6	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	6 to 20	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	20 to 60	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	60 to 200	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>200	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Material with strength less than 'Very Low' shall be described using soil characteristics. The presence of an original rock structure, fabric or texture should be noted, if relevant.

ROCK MATERIAL WEATHERING

Symbol		Term	Field Guide
RS		Residual Soil	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
XW		Extremely Weathered	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
DW	HW	Highly Weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
	MW	Moderately Weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable, but shows little or no change of strength from fresh rock.
SW		Slightly Weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
FR		Fresh	Rock shows no sign of decomposition of individual minerals or colour changes.

ABBREVIATIONS FOR DEFECT TYPES AND DESCRIPTIONS

Defect Type	
P	Parting
X	Foliation
L	Cleavage
C	Contact
J	Joint
SSu	Sheared Surface
SS	Sheared Seam
SZ	Sheared Zone
CS	Crushed Seam
IS	Infilled Seam
EWS	Extremely Weathered Seam
V	Vein

Coating or Infilling	
Cn	Clean
Sn	Stain
Ve	Veneer
Ct	Coating
In	Infill

Planarity	
Pl	Planar
Cv	Curved
Un	Undulating
St	Stepped
Ir	Irregular

Roughness	
VRo	Very Rough
Ro	Rough
Sm	Smooth
Po	Polished
Sl	Slickensided

Vertical Boreholes – The dip (inclination from horizontal) of the defect is given.
Inclined Boreholes – The inclination is measured as the acute angle between the core axis and the vertical direction.

APPENDIX B

Reports of Core Photographs GA20-HAW-BH-01 to GA20-HAW-BH-12

CLIENT Hayball Pty Ltd

JOB No. 20145767 **DEPTH** 5.0 m to 14.57 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne **CORE TYPE** NMLC

BOREHOLE GA20-BH-HAW-01 **DATE** 18/09/2020

END OF BOREHOLE AT 14.57 m

CLIENT
Hayball Pty Ltd

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15
PREPARED MH

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

BOREHOLE GA20-BHHAW-01 CORE PHOTOGRAPH

PROJECT NO. **20145767**

GOLDER

CLIENT Hayball Pty Ltd

JOB No. 20145767 **DEPTH** 3.4 m to 14.92 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne **CORE TYPE** NMLC

BOREHOLE GA20-BH-HAW-02 **DATE** 17/09/2020

END OF BOREHOLE AT 14.92 m

CLIENT
Hayball Pty Ltd

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15
PREPARED MH

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

BOREHOLE GA20-BH-HAW-02 CORE PHOTOGRAPH

PROJECT NO. **20145767**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

GOLDER

CLIENT Hayball Pty Ltd

JOB No. 20145767 **DEPTH** 2.0 m to 15.45 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne **CORE TYPE** NMLC

BOREHOLE GA20-BH-HAW-03 **DATE** 21/09/2020

END OF BOREHOLE AT 15.45 m

CLIENT
Hayball Pty Ltd

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15

PREPARED MH

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

BOREHOLE GA20-BH-HAW-03 CORE PHOTOGRAPH

PROJECT NO. **20145767**

GOLDER

CLIENT Hayball Pty Ltd

JOB No. 20145767

DEPTH 4.6 m to 15.35 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne

CORE TYPE NMLC

BOREHOLE GA20-BH-HAW-04

DATE 01/09/2020

END OF BOREHOLE AT 15.35 m

CLIENT
Hayball Pty Ltd

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15

PREPARED MH

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

BOREHOLE GA20-BH-HAW-04 CORE PHOTOGRAPH

PROJECT NO. **20145767**

GOLDER

CLIENT Hayball Pty Ltd

JOB No. 20145767

DEPTH 4.73 m to 15.52 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne

CORE TYPE NMLC

BOREHOLE GA20-BH-HAW-05

DATE 07/09/2020

END OF BOREHOLE AT 15.52 m

CLIENT
Hayball Pty Ltd

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15

PREPARED MH

BOREHOLE GA20-BH-HAW-05 CORE PHOTOGRAPH

PROJECT NO. **20145767**

CLIENT Hayball Pty Ltd

JOB No. 20145767

DEPTH 3.5 m to 13.6 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne

CORE TYPE NMLC

BOREHOLE GA20-BH-HAW-06

DATE 16/09/2020

END OF BOREHOLE AT 13.6 m

CLIENT
Hayball Pty Ltd

CONSULTANT
GOLDER

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

YYYY-MM-DD 2020-09-15

PREPARED MH

BOREHOLE GA20-BH-HAW-06 CORE PHOTOGRAPH

PROJECT NO. **20145767**

GOLDER

CLIENT Hayball Pty Ltd

JOB No. 20145767

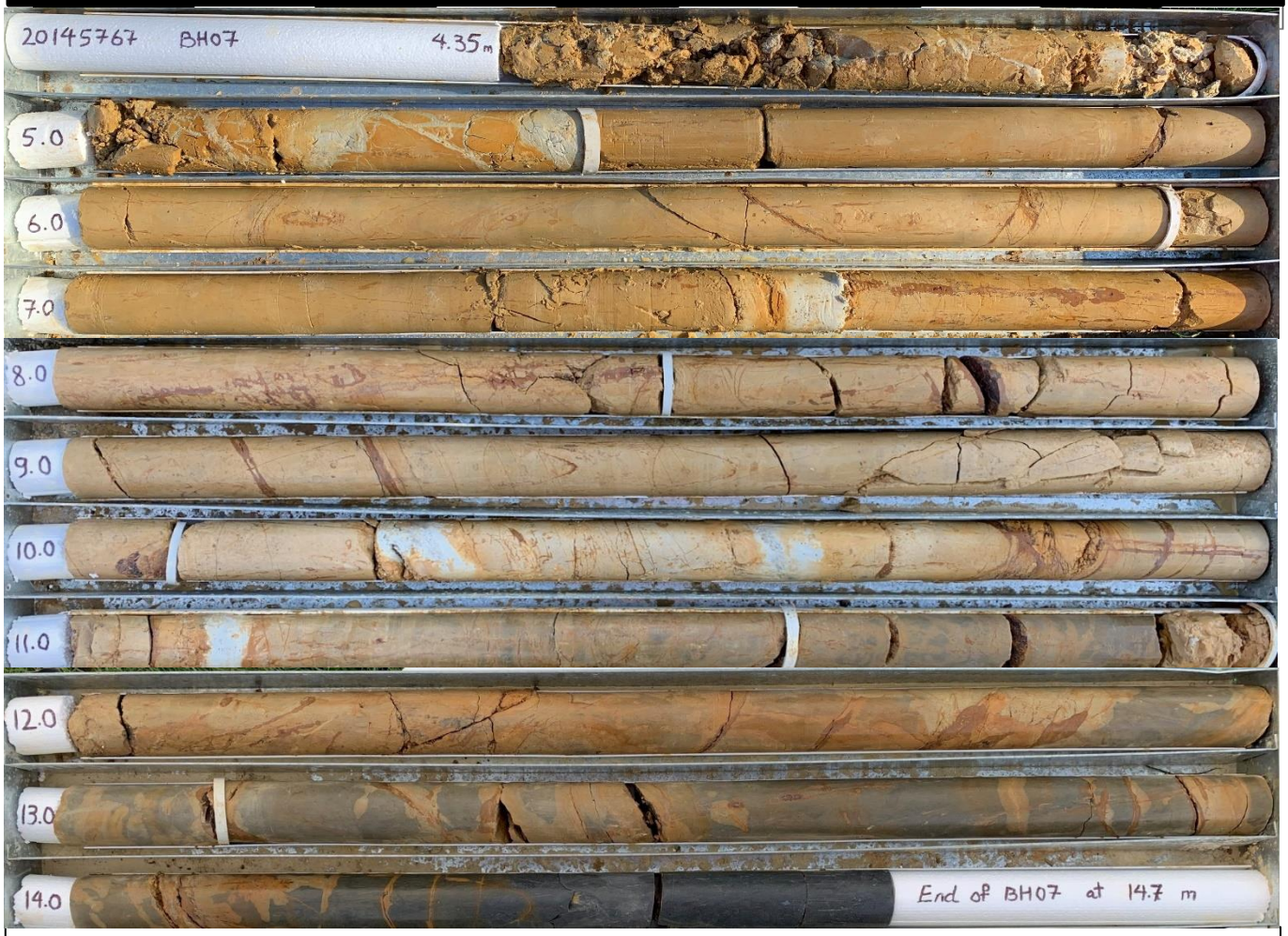
DEPTH 4.35 m to 14.7 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne

CORE TYPE NMLC

BOREHOLE GA20-BH-HAW-07

DATE 31/08/2020



END OF BOREHOLE AT 14.7 m

CLIENT
Hayball Pty Ltd

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15

PREPARED MH

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

BOREHOLE GA20-BH-HAW-07 CORE PHOTOGRAPH

PROJECT NO. **20145767**

CLIENT Hayball Pty Ltd

JOB No. 20145767

DEPTH 5.18 m to 14.2 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne

CORE TYPE NMLC

BOREHOLE GA20-BH-HAW-08

DATE 09/09/2020

END OF BOREHOLE AT 14.2 m

CLIENT
Hayball Pty Ltd

CONSULTANT
GOLDER

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

YYYY-MM-DD 2020-09-15

PREPARED MH

BOREHOLE GA20-BH-HAW-08 CORE PHOTOGRAPH

PROJECT NO. **20145767**

CLIENT Hayball Pty Ltd

JOB No. 20145767

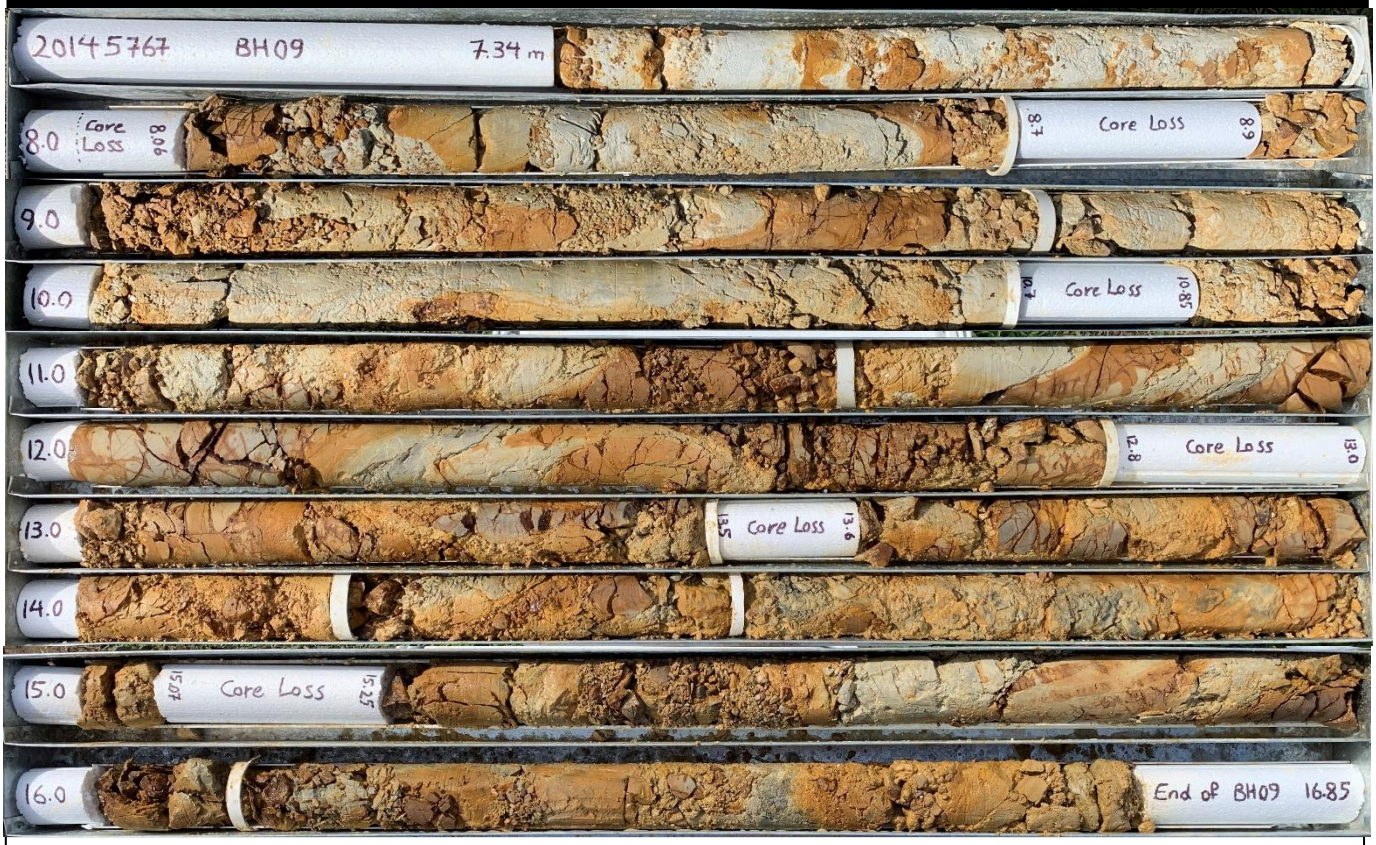
DEPTH 7.34 m to 16.85 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne

CORE TYPE NMLC

BOREHOLE GA20-BH-HAW-09

DATE 04/09/2020



END OF BOREHOLE AT 16.85 m

CLIENT
Hayball Pty Ltd

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15

PREPARED MH

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

BOREHOLE GA20-BH-HAW-09 CORE PHOTOGRAPH

PROJECT NO. **20145767**

CLIENT Hayball Pty Ltd

JOB No. 20145767

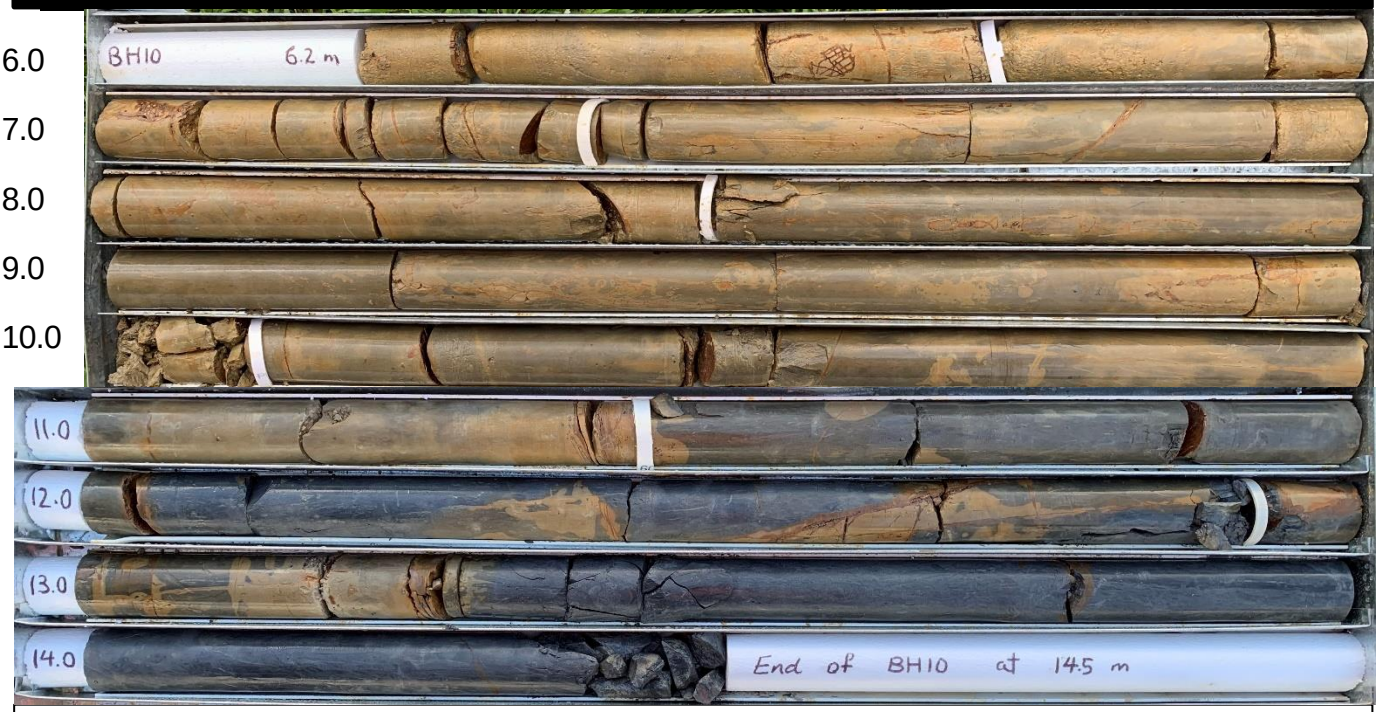
DEPTH 6.2 m to 14.5 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne

CORE TYPE NMLC

BOREHOLE GA20-BH-HAW-10

DATE 22/09/2020



END OF BOREHOLE AT 14.5 m

CLIENT
Hayball Pty Ltd

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15

PREPARED MH

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

BOREHOLE GA20-BH-HAW-10 CORE PHOTOGRAPH

PROJECT NO. **20145767**

GOLDER

CLIENT Hayball Pty Ltd

JOB No. 20145767

DEPTH 2.87 m to 14.53 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne

CORE TYPE NMLC

BOREHOLE GA20-BH-HAW-11

DATE 11/09/2020

END OF BOREHOLE AT 14.53 m

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

1m

0

CLIENT
Hayball Pty Ltd

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15

PREPARED MH

BOREHOLE GA20-BH-HAW-11 CORE PHOTOGRAPH

PROJECT NO. **20145767**

CLIENT Hayball Pty Ltd

JOB No. 20145767 **DEPTH** 8.05 m to 17.2 m

JOB Public Housing Renewal– 1-7 Bills Street, Hawthorn , Melbourne **CORE TYPE** NMLC

BOREHOLE GA20-BH-HAW-12 **DATE** 14/09/2020

END OF BOREHOLE AT 17.2 m

CLIENT
Hayball Pty Ltd

PROJECT
Public Housing Renewal– 1-7 Bills Street, Hawthorn

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-15

PREPARED

BOREHOLE GA20-BH-HAW-12 CORE PHOTOGRAPH

PROJECT NO. **20145767**

APPENDIX C

Reports of Groundwater Wells

GA20-BH-HAW-01

GA20-BH-HAW-03

GA20-BH-HAW-09

GA20-BH-HAW-09

GA20-BH-HAW-10

GA20-BH-HAW-12

Groundwater Well Licenses

Works Licence ID:

WLE079046

Printed on: 28 Aug 2020 11:29:11 am

COPY OF RECORD IN THE VICTORIAN WATER REGISTER

LICENCE TO CONSTRUCT WORKS

under Section 67 of the Water Act 1989

The information in this copy of record is as recorded at the time of printing. Current information should be obtained by a search of the register. The State of Victoria does not warrant the accuracy or completeness of this information and accepts no responsibility for any subsequent release, publication or reproduction of this information.

This licence does not remove the need to apply for any authorisation or permission necessary under any other Act of Parliament with respect to anything authorised by the works licence.

Water used under this licence is not fit for any use that may involve human consumption, directly or indirectly, without first being properly treated.

This licence is not to be interpreted as an endorsement of the design and/or construction of any works (including dams). The Authority does not accept any responsibility or liability for any suits or actions arising from injury, loss, damage or death to person or property which may arise from the maintenance, existence or use of the works.

Each person named as a licence holder is responsible for ensuring all the conditions of this licence are complied with.

This licence authorises its holders to construct the described works, subject to the conditions.

Licence Holder(s)

DEPARMENT OF HEALTH AND HUMAN SERVICES of 120 RACECOURSE RD FLEMINGTON VIC 3031

Licence Contact Details

DEPARMENT OF HEALTH AND HUMAN SERVICES	120 RACECOURSE RD FLEMINGTON VIC 3031

Licence Details

Expiry date	28 Aug 2021
Status	Active
Authority	Southern Rural Water
Name of waterway or aquifer	NA for construct/decommission
Water system	Unincorporated (GMU)

Summary of Licensed Works

The details in this section are a summary only. They are subject to the conditions specified in this licence.

Works ID	*Works type*	*Use of water*
WRK122312	Bore	Observation
WRK122313	Bore	Observation
WRK122314	Bore	Observation
WRK122315	Bore	Observation
WRK122316	Bore	Observation
WRK122317	Bore	Observation

Description of Licensed Works

WORKS ID WRK122312

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	30.000 metres

Works location

Easting	*Northing*	*Zone MGA*
327557.593	5810280.313	Zone 55

Land description

Volume 8167 Folio 033
Lot 1 of Plan TP242273Y

Property address

4/6 BILLS STREET, HAWTHORN, VIC 3122

Description of Licensed Works

WORKS ID WRK122313

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	30.000 metres

Works location

Easting	*Northing*	*Zone MGA*
327631.791	5810271.900	Zone 55

Land description

Volume 8167 Folio 033
Lot 1 of Plan TP242273Y

Property address

4/6 BILLS STREET, HAWTHORN, VIC 3122

Description of Licensed Works

WORKS ID WRK122314

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	30.000 metres

Works location

Easting	*Northing*	*Zone MGA*
327640.140	5810349.097	Zone 55

Land description
Volume 8167 Folio 033
Lot 1 of Plan TP242273Y

Property address
4/6 BILLS STREET, HAWTHORN, VIC 3122

Description of Licensed Works

WORKS ID WRK122315

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	30.000 metres

Works location

Easting	*Northing*	*Zone MGA*
327570.834	5810362.617	Zone 55

Land description
Volume 8167 Folio 033
Lot 1 of Plan TP242273Y

Property address
4/6 BILLS STREET, HAWTHORN, VIC 3122

Description of Licensed Works

WORKS ID WRK122316

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	30.000 metres

Works location

Easting	*Northing*	*Zone MGA*
327615.174	5810300.551	Zone 55

Land description
Volume 8167 Folio 033
Lot 1 of Plan TP242273Y

Property address
4/6 BILLS STREET, HAWTHORN, VIC 3122

Description of Licensed Works

WORKS ID WRK122317

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	30.000 metres

Works location

Easting	*Northing*	*Zone MGA*
327587.580	5810327.967	Zone 55

Land description

Volume 8167 Folio 033
Lot 1 of Plan TP242273Y

Property address

4/6 BILLS STREET, HAWTHORN, VIC 3122

Related Instruments

Related entitlements	Nil
Related water-use entities	Nil

Application History

Reference	*Type*	*Status*	*Lodged date*	*Approved date*	*Recorded date*
WLI613351	Issue	Approved	28 Aug 2020	28 Aug 2020	

Conditions

Licence WLE079046 is subject to the following conditions:

Siting and construction

1 The bore(s) must be drilled at the location specified in the application approved by the Authority.

2 If after drilling the bore is considered unsatisfactory a replacement bore may be drilled on the land specified in the licence.

Preventing pollution

3 All earthworks must be carried out, and all drilling fluids and waters produced during construction and development must be disposed of, in ways that avoid contaminating native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.

4 Construction must stop immediately if the Authority reasonably believes that fuel, lubricant, drilling fluid, soil or water produced during construction and development is at risk of being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.

5 The licence holder must construct and maintain bund walls, in accordance with the timeframe, specifications, guidelines or standards prescribed by the Authority, to prevent fuel, lubricant, drilling fluid, soil or water produced during construction and development from being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.

Construction standards

6 The bore(s) must be constructed, and where relevant decommissioned, in accordance with the Minimum Construction Requirements for Water Bores in Australia, Edition 3 or its successor.

Drilling licence and supervision requirements

7 The bore(s) must be constructed by, or under the direct supervision of, a driller licensed under the Water Act 1989 and endorsed as a Class 1, 2, or 3 driller, with appropriate endorsements.

8 If artesian pressure is expected or encountered, then a driller licensed under the Water Act 1989, and endorsed as a class 3 driller, must install casing in the bore(s) to a suitable depth, and in a suitable manner, to prevent its outbreak. A suitable valve must also be fitted to the bore.

Bore completion report

9 A Bore Completion Report must be submitted to the Authority within 28 working days of the bore(s) being completed.

Protecting water resources

10 No more than 6 bore(s) may be brought to final development under this licence.

11 At the completion of drilling and before the drilling rig leaves the site, all but 6 bore(s) must be decommissioned so as to eliminate physical hazards, conserve aquifer yield, prevent groundwater contamination and prevent the intermingling of desirable and undesirable waters.

12 The bore(s) must be located at least 30 metres from any authority's channel, reserve or easement unless authorised by the Authority.

Protecting water quality

13 Drilling must not exceed the maximum depth.

14 The bore(s) must be constructed so as to prevent aquifer contamination caused by vertical flow outside the casing.

15 If two or more aquifers are encountered, the bore(s) must be constructed to ensure that an impervious seal is made and maintained between each aquifer to prevent aquifer connection through vertical flow outside the casing; under no circumstances are two or more aquifers to be screened within the one bore or in any other manner to allow connection between them.

16 Boreheads must be constructed, to ensure that no flood water, surface runoff or potential

subsurface contaminated soakage can enter the bore or bore annulus.

Protecting other water users

17 The diameter of the drill casing must not exceed 130 millimetres.

18 The bore(s) must be constructed so that water levels in the bore(s) can be measured by an airline, a piezometer or a method approved in writing by the Authority.

Fees and charges

19 The licence holder must, when requested by the Authority, pay all fees, costs and other charges under the Water Act 1989 in respect of this licence.

END OF COPY OF RECORD

REPORT OF STANDPIPE INSTALLATION: GA20-BH-HAW-01

SHEET: 1 OF 1

CLIENT:	Hayball Pty Ltd	COORDS: 327566.8 m E 5810364.8 m N MGA94 55	DRILL RIG: Comacchio Geo 205
PROJECT:	Public Housing Renewal Project	SURFACE RL: 16.9 m DATUM: AHD	CONTRACTOR: Contract Drilling Services Pty Ltd
LOCATION:	1-7 Bills Street, Hawthorn	INCLINATION: -90° DIRECTION: 000°	LOGGED: SHZ DATE: 18-9-20
JOB NO:	20145767	HOLE DEPTH: 14.57 m	CHECKED: PGS DATE: 20-10-20

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	
ADT		0	16.90		CLAY	Flush Gatic
			0.50			
			16.40		SANDY CLAY	
			1.00			0.0-3.5m: Bentonite Seal
					SANDY CLAY	
			15.40		CLAYEY SAND	
		2	2.50			
			14.40		CLAY	
			2.90			
			14.00			
WB	100% Water RETURN					3.50, RL13.40
		4				4.00, RL12.90
			4.50			0.0-4.0m: Class 18, 50mm PVC
NMLC			12.40			
			5.00			
			5.30		GRAVEL	
NMLC	100% Water RETURN				SILTSTONE	
		6	6.46			
			10.44			4.0-10.0m: machine slotted, 50mm PVC
		8	8.00			3.5m-10.5m: 16/30mm Grade Sand filter pack
			8.90			
			8.50			
			8.40			
	24-09-20					
		10	10.00			10.00, RL6.90
NMLC	100% Water RETURN		6.90		SILTSTONE	10.0 m: Bottom of screen
			11.50			
			5.40			
		12	12.00			
			4.90			
			12.60			
			4.30			
		14	14.00			
			2.90			
			14.57			14.57, RL2.33
			2.33		END OF BOREHOLE @ 14.57 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 9.00 m DEPTH STANDPIPE INSTALLED	
		16				
		18				
		20				

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17 RL1

REPORT OF STANDPIPE INSTALLATION: GA20-BH-HAW-03

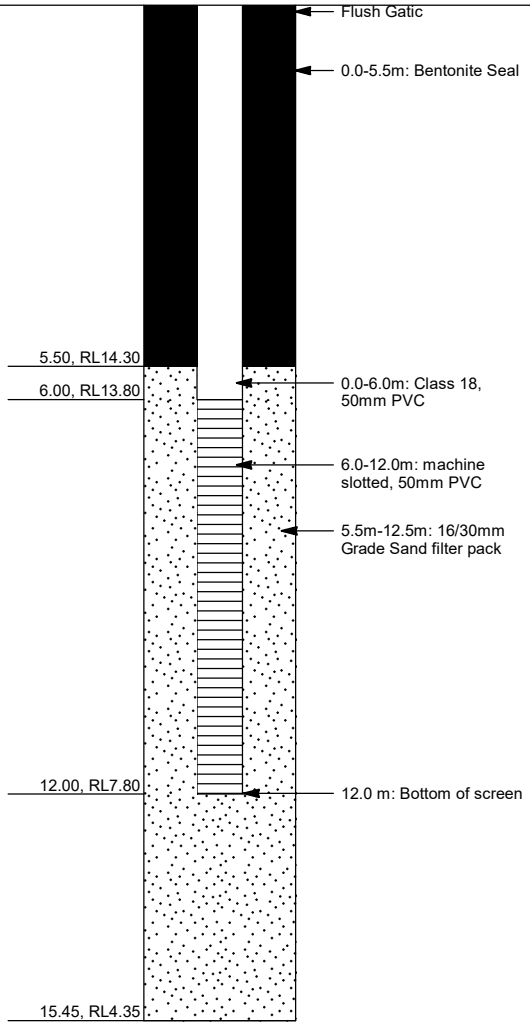
SHEET: 1 OF 1

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327631.9 m E 5810356.3 m N MGA94 55
SURFACE RL: 19.8 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.45 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 21-9-20
CHECKED: PGS DATE: 20-10-20

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	
ADT		0	0.40		SANDY GRAVELLY CLAY	
			19.40		CLAY	
			1.00			
			18.80			
			1.50			
			18.30			
			2.00			
NMLC	100% Water RETURN		17.80		SILTSTONE	
			2.65			
			17.15		CORE LOSS	
			3.67			
			16.13		SILTSTONE/BRECCIA	
			4.60			
			15.20		SILTSTONE	
		5	5.12			
			14.59		CORE LOSS	
			5.70		SILTSTONE	
			6.12		CORE LOSS	
			13.68		SILTSTONE/BRECCIA	
			6.70			
			13.10		CORE LOSS	
			7.35			
			12.45		SILTSTONE/BRECCIA	
			8.10			
	24-09-20		8.50		CORE LOSS	
					SILTSTONE/BRECCIA	
			11.12		CORE LOSS	
			9.30		SILTSTONE/BRECCIA	
			10.50		CORE LOSS	
			9.78			
NMLC	100% Water RETURN	10	10.02		SILTSTONE/BRECCIA	
			11.52			
			11.90		CORE LOSS	
					SILTSTONE/BRECCIA	
			12.50			
			7.13		CORE LOSS	
					SILTSTONE/BRECCIA	
			13.50			
			13.74		CORE LOSS	
			6.06		SILTSTONE/BRECCIA	
			14.60			
			15.00		CORE LOSS	
		15	15.45		SILTSTONE/BRECCIA	
			4.35		END OF BOREHOLE @ 15.45 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 8.40 m DEPTH STANDPIPE INSTALLED	
		20				



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17 RL1

REPORT OF STANDPIPE INSTALLATION: GA20-BH-HAW-05

SHEET: 1 OF 1

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327597.8 m E 5810320.3 m N MGA94 55
SURFACE RL: 15.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 15.52 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 7-9-20
CHECKED: PGS DATE: 20-10-20

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	
ADT		0	15.00		SANDY CLAY	
			0.50			
			14.50		CLAYEY SAND	
			1.00			
			14.00		CLAY	
			1.50			
			13.50		CLAY	
		2				
			2.80			
WB	100% Water RETURN		12.20		GRAVELLY CLAY	
			4.00			
		4	11.00		SILTSTONE	
			4.73			
			5.00		SILTSTONE	
			10.00		CORE LOSS	
			5.45			
NMLC			9.55		SILTSTONE	
		6	6.10			
			8.80		CORE LOSS	
			6.60		SILTSTONE	
			8.40		CORE LOSS	
			7.10			
			7.90		SILTSTONE	
			7.80			
			7.85			
	24-09-20	8	7.15			
			9.85			
	100% Water RETURN	10	5.15			
			11.15			
NMLC			3.85			
		12				
			12.25			
			2.75			
		14				
			15.00			
			0.00			
			15.52			
		16	-0.52		END OF BOREHOLE @ 15.52 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 8.20 m DEPTH STANDPIPE INSTALLED	
		18				

Flush Gatic
0.0-3.5m: Bentonite Seal
3.50, RL11.50
4.00, RL11.00
0.0-4.0m: Class 18, 50mm PVC
4.0-10.0m: machine slotted, 50mm PVC
3.5m-10.5m: 16/30mm Grade Sand filter pack
10.00, RL5.00
10.0 m: Bottom of screen
15.52, RL-0.52

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: GA20-BH-HAW-09

SHEET: 1 OF 1

CLIENT: Hayball Pty Ltd
PROJECT: Public Housing Renewal Project
LOCATION: 1-7 Bills Street, Hawthorn
JOB NO: 20145767

COORDS: 327635.2 m E 5810298.2 m N MGA94 55
SURFACE RL: 16.0 m DATUM: AHD
INCLINATION: -90° DIRECTION: 000°
HOLE DEPTH: 16.85 m

DRILL RIG: Comacchio Geo 205
CONTRACTOR: Contract Drilling Services Pty Ltd
LOGGED: SHZ DATE: 4-9-20
CHECKED: PGS DATE: 20-10-20

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	
ADT		0	16.00		SANDY CLAY	Flush Gatic
			0.80			
			15.20		CLAY	0.0-3.5m: Bentonite Seal
			1.40			
			14.60			
		2	2.50			
WB			13.50		SANDY CLAY	
						3.50, RL12.50
			4.00			4.00, RL12.00
		4	12.00		CLAY	0.0-4.0m: Class 18, 50mm PVC
			4.50			
NMLC			11.50			
			5.50			
			10.50			
			5.90			
		6	10.10			
			7.00			
			7.34		SILTSTONE	4.0-10.0m: machine slotted, 50mm PVC
			8.66		SILTSTONE/BRECCIA	
			8.00			
		8	7.94		CORE LOSS	3.5m-10.5m: 16/30mm Grade Sand filter pack
					SILTSTONE/BRECCIA	
			8.70			
			8.90		CORE LOSS	
			7.10		SILTSTONE/BRECCIA	
		10				10.00, RL6.00
			10.70			10.0 m: Bottom of screen
			5.15		CORE LOSS	
					SILTSTONE/BRECCIA	
			11.60			
NMLC	100% Water RETURN		4.40		SILTSTONE	
		12	12.50			
			12.80		SILTSTONE/BRECCIA	
			13.00		CORE LOSS	
			3.00		SILTSTONE/BRECCIA	
			13.50			
			2.40		CORE LOSS	
		14			SILTSTONE/BRECCIA	
			15.07			
			0.75		CORE LOSS	
					SILTSTONE/BRECCIA	
		16				
			16.85			16.85, RL-0.85
			-0.85		END OF BOREHOLE @ 16.85 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 5.20 m DEPTH STANDPIPE INSTALLED	
		18				

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17 RL1

REPORT OF STANDPIPE INSTALLATION: GA20-BH-HAW-10

SHEET: 1 OF 1

CLIENT:	Hayball Pty Ltd	COORDS: 327562.5 m E 5810276.2 m N MGA94 55	DRILL RIG: Comacchio Geo 205
PROJECT:	Public Housing Renewal Project	SURFACE RL: 11.5 m DATUM: AHD	CONTRACTOR: Contract Drilling Services Pty Ltd
LOCATION:	1-7 Bills Street, Hawthorn	INCLINATION: -90° DIRECTION: 000°	LOGGED: SHZ DATE: 22-9-20
JOB NO:	20145767	HOLE DEPTH: 14.50 m	CHECKED: PGS DATE: 20-10-20

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	
ADT		0	11.50		SANDY CLAY	Flush Gatic
			0.50			
			11.00		CLAY	0.0-3.5m: Bentonite Seal
			1.00			
			10.50			
			1.50			
			10.00			
		2				
			2.50			
			2.80			
			8.70		CLAY	
			3.20			
			8.30		CLAY	3.50, RL8.00
		4				4.00, RL7.50
			4.50			0.0-4.0m: Class 18, 50mm PVC
WB			7.00			
			6.00			
		6	6.20		SILTSTONE	
NMLC	100% Water RETURN		5.30		SILTSTONE	
						4.0-10.0m: machine slotted, 50mm PVC
		8				3.5m-10.5m: 16/30mm Grade Sand filter pack
			8.50			
			3.00			
		10				10.00, RL1.50
NMLC	100% Water RETURN					10.0 m: Bottom of screen
			11.45			
			0.05			
		12				
		14				
			14.50			14.50, RL-3.00
			-3.00		END OF BOREHOLE @ 14.50 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 5.10 m DEPTH STANDPIPE INSTALLED	
		16				

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: GA20-BH-HAW-12

SHEET: 1 OF 1

CLIENT:	Hayball Pty Ltd	COORDS: 327649.7 m E 5810276.0 m N MGA94 55	DRILL RIG: Comacchio Geo 205
PROJECT:	Public Housing Renewal Project	SURFACE RL: 15.9 m DATUM: AHD	CONTRACTOR: Contract Drilling Services Pty Ltd
LOCATION:	1-7 Bills Street, Hawthorn	INCLINATION: -90° DIRECTION: 000°	LOGGED: SHZ DATE: 14-9-20
JOB NO:	20145767	HOLE DEPTH: 17.20 m	CHECKED: PGS DATE: 20-10-20

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	
ADT		0	15.90		GRAVELLY SANDY CLAY	Flush Gatic
			0.50			
			15.40			0.0-3.5m: Bentonite Seal
			1.00			
			14.90		CLAY	
		2				
			2.50			
			13.40			
			3.80			3.50, RL12.40
		4	12.10		CLAY	4.00, RL11.90 0.0-4.0m: Class 18, 50mm PVC
WB			5.50			
			10.40		CLAY	
		6				
NMLC			7.00			4.0-10.0m: machine slotted, 50mm PVC
			8.90			
			8.00			3.5m-10.5m: 16/30mm Grade Sand filter pack
		8	8.40		CORE LOSS	
			7.40		SILTSTONE	
			9.00		CORE LOSS	
			6.90		SILTSTONE/BRECCIA	
			9.48		SILTSTONE	
			6.35		CORE LOSS	
		10	10.10		SILTSTONE	10.00, RL5.90 10.0 m: Bottom of screen
			5.62		CORE LOSS	
			10.70		SILTSTONE	
			5.20		SILTSTONE/BRECCIA	
			11.83			
NMLC	50% Water RETURN	12	4.07		SILTSTONE	
		14				
			16.00			
		16	0.10			
			16.30			
			-0.40			
			16.80			
			-0.90			
			17.20			17.20, RL-1.30
			-1.30		END OF BOREHOLE @ 17.20 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 4.30 m DEPTH STANDPIPE INSTALLED	
		18				

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17 RL1

APPENDIX D

Laboratory Testing Reports

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

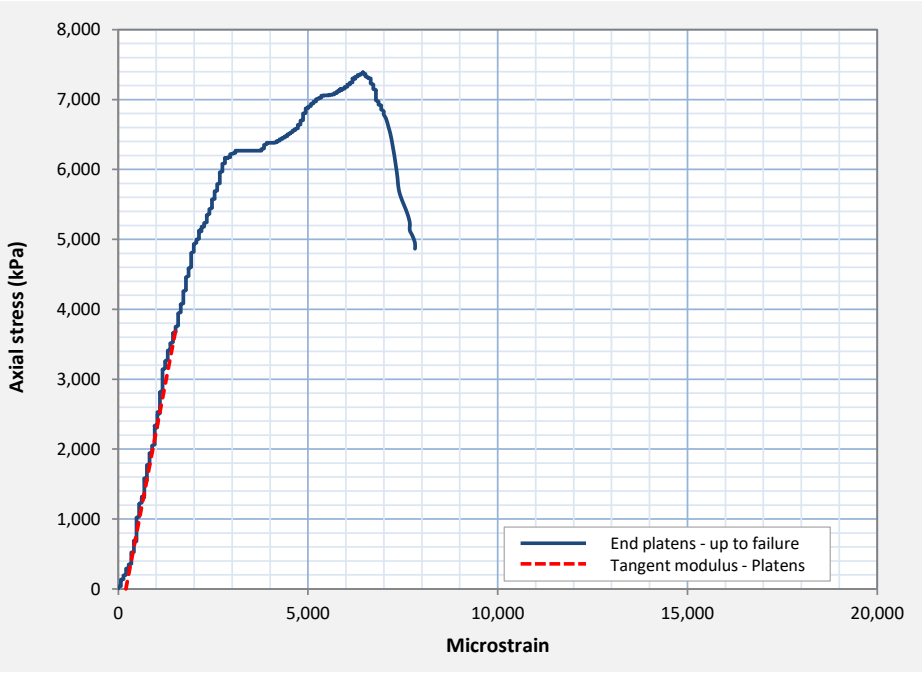
GOLDER

Test request #:	**TRM20-0614**	**Specimen ID:**	**LMEL202009301**	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			**MELBOURNE GEOTECHNICAL LABORATORY**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	**20145767-003**	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-01**		**Sample depth (m):**	**6.80 - 7.00**
				Client sample ref:	**GA20-BH01-005**
Project reference:		**Loc. ref.:**	-		

Sample description:	SILTSTONE, brown and grey	**Specimen mass (g):**	690.0
Specimen history:	Specimen soaked for at least 24 hours prior to testing.	**Specimen height (mm):**	145.8
		Specimen diameter (mm):	48.7
		Length diameter ratio (L:D):	3.0 : 1.0
Moisture content:	**7.1%** **Soaked** *(In accordance with AS 4133.1.1.1-2005)*	**Density [as tested] (t/m^3):**	2.54
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.37
	Date of test: 12/10/20 **Rate of travel**	**Time at peak load:**	7:12:41 AM
	Time start of test: 6:58:22 AM 0.070 mm/min	**Time to failure:**	14 mins 19 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 2.8 GPa **Uniaxial Compressive Strength:** **7.4 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by vertical shear with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** **14/10/20**

Cert. ref.: **20145767-003_GA20-BH-HAW-01_2009301_TRM20-0614_UCS.4.2.2_R20057560** **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

Aaron Stevenson - Senior Technician

Phone: +61 (03) 8862 3500 **Fax:** +61 (03) 8862 3501 **E-mail:** melbgeolab@golder.com.au **Web:** www.golder.com.au

This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

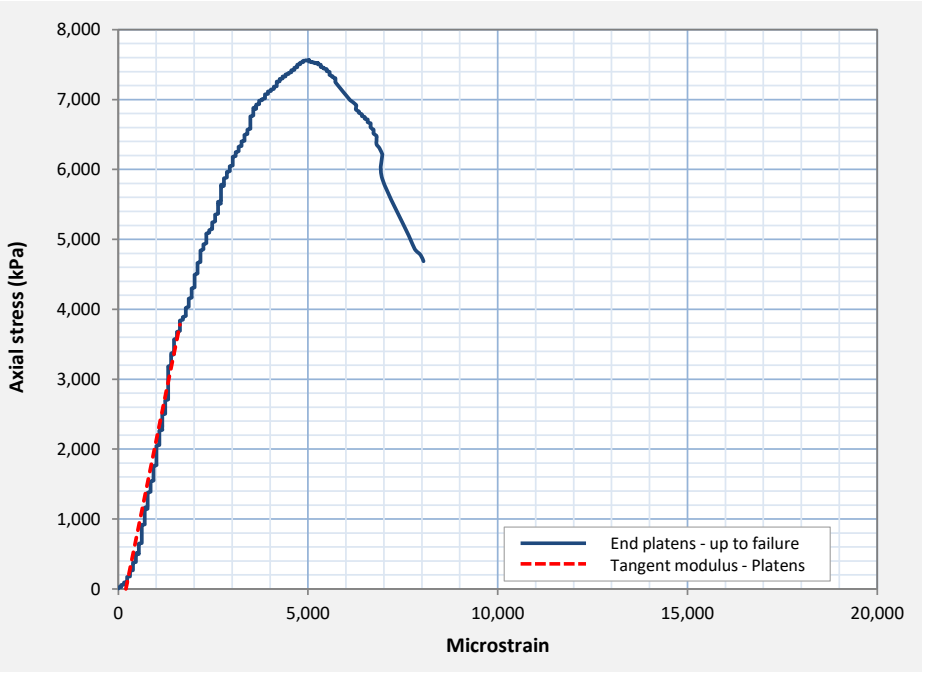
Test request #:	**TRM20-0614**	**Specimen ID:**	**LMEL202009303**	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			**MELBOURNE GEOTECHNICAL LABORATORY**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	**20145767-003**	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-01**		**Sample depth (m):**	**9.45 - 9.60**
				Client sample ref:	**GA20-BH01-008**
Project reference:		**Loc. ref.:**	-		

Sample description:	SILTSTONE, brown and grey	**Specimen mass (g):**	630.5
Specimen history:	Specimen soaked for at least 24 hours prior to testing.	**Specimen height (mm):**	129.3
		Specimen diameter (mm):	50.4
		Length diameter ratio (L:D):	2.6 : 1.0
Moisture content:	**7.6%** **Soaked** *(In accordance with AS 4133.1.1.1-2005)*	**Density [as tested] (t/m^3):**	2.45
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.28

Date of test:	12/10/20	**Rate of travel**		**Time at peak load:**	7:33:51 AM
Time start of test:	7:21:53 AM	0.050 mm/min		**Time to failure:**	11 mins 58 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 2.7 GPa **Uniaxial Compressive Strength:** **7.6 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by diagonal shear approximately 80 degrees to horizontal with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** **14/10/20**

Cert. ref.: **20145767-003_GA20-BH-HAW-01_2009303_TRM20-0614_UCS.4.2.2_R20057561** **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

Aaron Stevenson - Senior Technician

Phone: +61 (03) 8862 3500 **Fax:** +61 (03) 8862 3501 **E-mail:** melbgeolab@golder.com.au **Web:** www.golder.com.au

This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

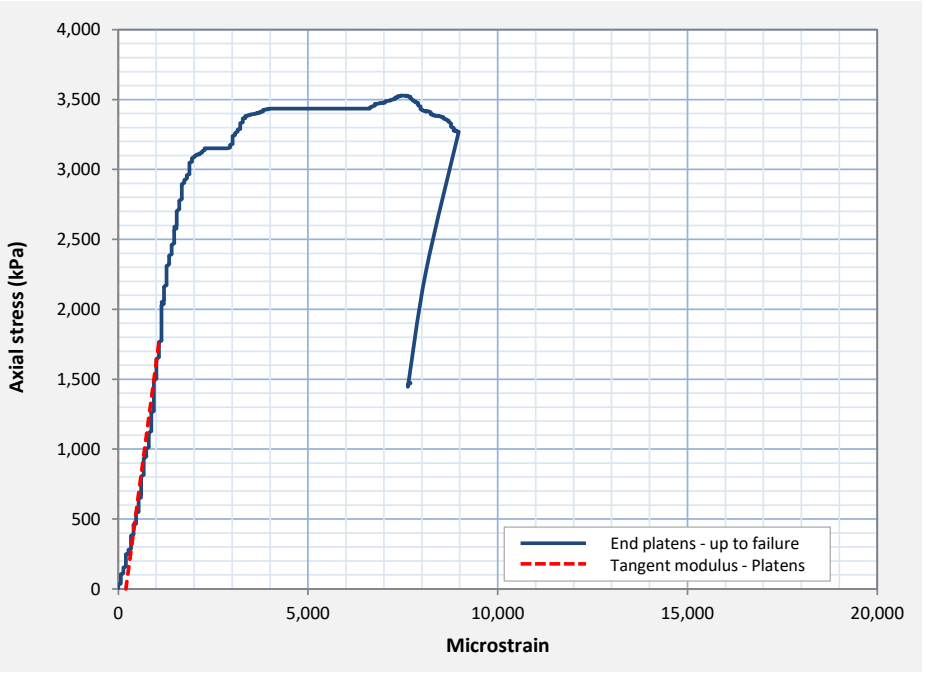
Test request #:	TRM20-0614	**Specimen ID:**	LMEL202009306	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			MELBOURNE GEOTECHNICAL LABORATORY	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	20145767-003	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-01**		**Sample depth (m):**	13.00 - 13.19
				Client sample ref:	GA20-BH01-012
Project reference:		**Loc. ref.:**	-		

Sample description:	SILTSTONE, brown and grey	**Specimen mass (g):**	743.4
Specimen history:	Specimen soaked for at least 24 hours prior to testing.	**Specimen height (mm):**	149.4
		Specimen diameter (mm):	51.1
		Length diameter ratio (L:D):	2.9 : 1.0
Moisture content:	8.4% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*	**Density [as tested] (t/m^3):**	2.43
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.24

Date of test:	09/10/20	**Rate of travel**		**Time at peak load:**	1:18:35 PM
Time start of test:	1:07:33 PM	0.100 mm/min		**Time to failure:**	11 mins 2 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 2 GPa **Uniaxial Compressive Strength:** **3.5 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by diagonal shear approximately 75 degrees to horizontal with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** 14/10/20

Cert. ref.: 20145767-003_GA20-BH-HAW-01_2009306_TRM20-0614_UCS.4.2.2_R20057562 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL [PAGE 1 OF 1]

Aaron Stevenson - Senior Technician

Phone: +61 (03) 8862 3500 **Fax:** +61 (03) 8862 3501 **E-mail:** melbgeolab@golder.com.au **Web:** www.golder.com.au

This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

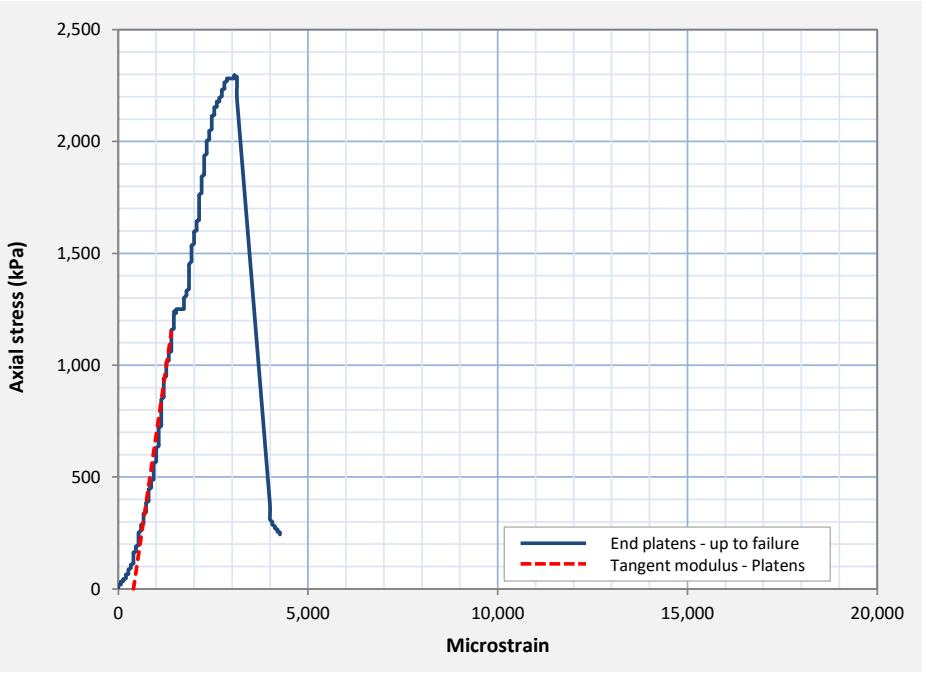
Test request #:	**TRM20-0614**	**Specimen ID:**	**LMEL202009309**	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			**MELBOURNE GEOTECHNICAL LABORATORY**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	**20145767-003**	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-02**		**Sample depth (m):**	**4.18 - 4.36**
				Client sample ref:	**GA20-BH02-004**
Project reference:		**Loc. ref.:**	-		

Sample description:	SILTSTONE, brown	**Specimen mass (g):**	717.7
Specimen history:	Specimen soaked for at least 24 hours prior to testing.	**Specimen height (mm):**	150.2
		Specimen diameter (mm):	50.4
		Length diameter ratio (L:D):	3.0 : 1.0
Moisture content:	**9.4%** **Soaked** *(In accordance with AS 4133.1.1.1-2005)*	**Density [as tested] (t/m^3):**	2.40
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.19

Date of test:	09/10/20	**Rate of travel**		**Time at peak load:**	10:41:47 AM
Time start of test:	10:35:00 AM	0.070 mm/min		**Time to failure:**	6 mins 47 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 1.2 GPa **Uniaxial Compressive Strength:** **2.3 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by diagonal shear approximately 75 degrees to horizontal

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** **14/10/20**

Cert. ref.: **20145767-003_GA20-BH-HAW-02_2009309_TRM20-0614_UCS.4.2.2_R20057563** **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

Aaron Stevenson - Senior Technician

Phone: +61 (03) 8862 3500 **Fax:** +61 (03) 8862 3501 **E-mail:** melbgeolab@golder.com.au **Web:** www.golder.com.au

This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

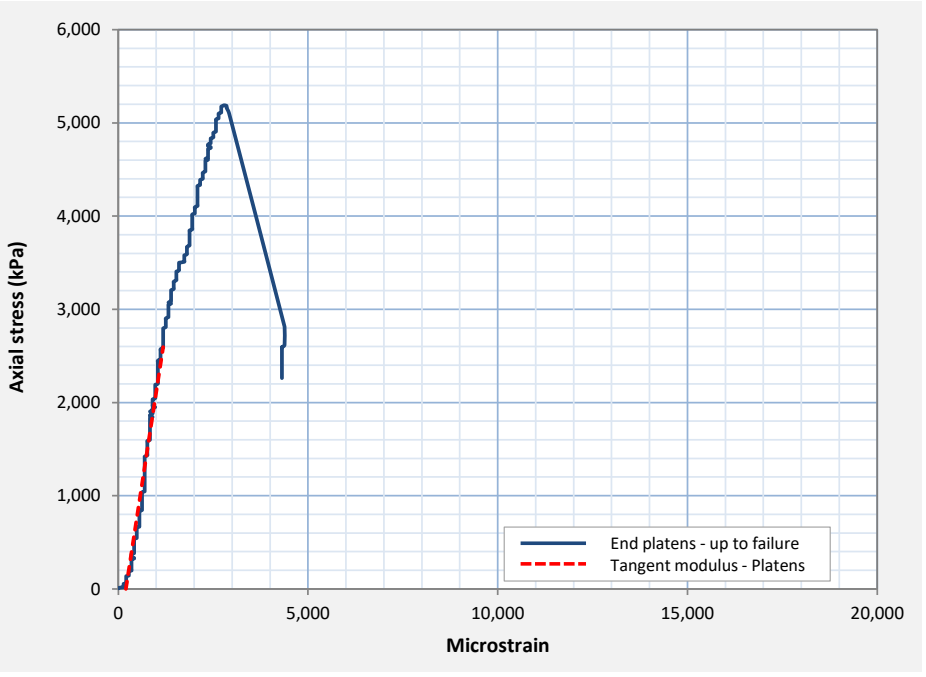
Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093011	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			MELBOURNE GEOTECHNICAL LABORATORY	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	20145767-003	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	GA20-BH-HAW-02		**Sample depth (m):**	6.60 - 6.78
				Client sample ref:	GA20-BH02-006
Project reference:		**Loc. ref.:**	-		

Sample description:	SILTSTONE, brown with grey	**Specimen mass (g):**	672.5
Specimen history:	Specimen soaked for at least 24 hours prior to testing.	**Specimen height (mm):**	143.8
		Specimen diameter (mm):	50.2
		Length diameter ratio (L:D):	2.9 : 1.0
Moisture content:	9.2% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*	**Density [as tested] (t/m^3):**	2.36
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.16

Date of test:	08/10/20	**Rate of travel**		**Time at peak load:**	11:50:04 AM
Time start of test:	11:41:29 AM	0.050 mm/min		**Time to failure:**	8 mins 35 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 2.6 GPa **Uniaxial Compressive Strength:** **5.2 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by diagonal shear approximately 80 degrees to horizontal with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** **14/10/20**

Cert. ref.: 20145767-003_GA20-BH-HAW-02_20093011_TRM20-0614_UCS.4.2.2_R20057564 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

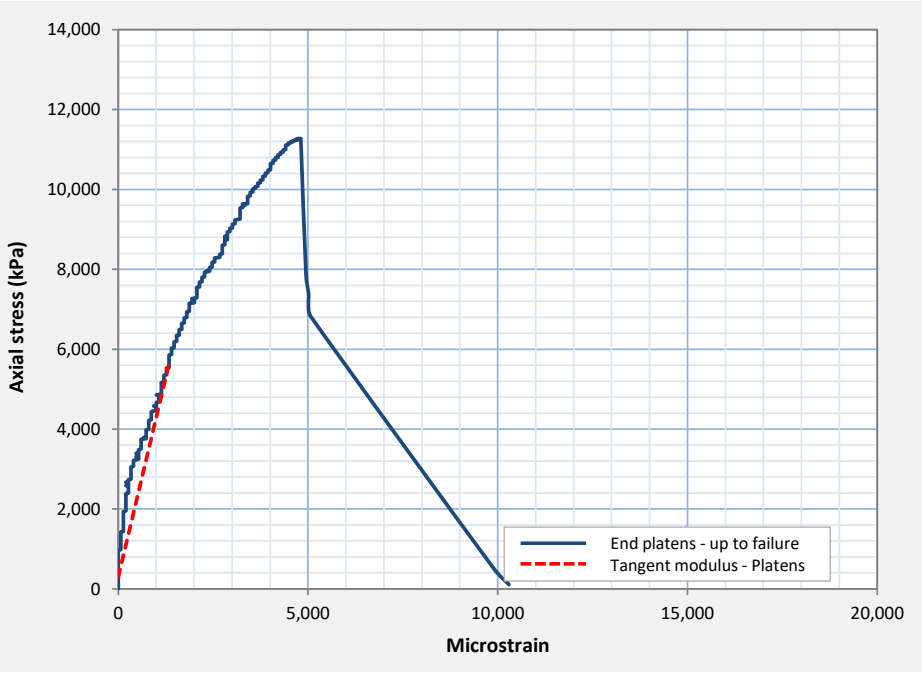
GOLDER

Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093014	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			MELBOURNE GEOTECHNICAL LABORATORY	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	20145767-003	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	GA20-BH-HAW-02		**Sample depth (m):**	10.32 - 10.50
				Client sample ref:	GA20-BH02-010
Project reference:		**Loc. ref.:**	-		

Sample description:	SILTSTONE, brown with grey	**Specimen mass (g):**	747.0
Specimen history:	Specimen soaked for at least 24 hours prior to testing.	**Specimen height (mm):**	149.6
		Specimen diameter (mm):	50.7
		Length diameter ratio (L:D):	2.9 : 1.0
Moisture content:	7.4% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*	**Density [as tested] (t/m^3):**	2.47
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.30
	Date of test: 09/10/20 **Rate of travel**	**Time at peak load:**	12:25:37 PM
	Time start of test: 12:10:40 PM 0.050 mm/min	**Time to failure:**	14 mins 57 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 4 GPa **Uniaxial Compressive Strength:** **11 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by diagonal shear approximately 70 degrees to horizontal

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** 14/10/20

Cert. ref.: 20145767-003_GA20-BH-HAW-02_20093014_TRM20-0614_UCS.4.2.2_R20057565 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

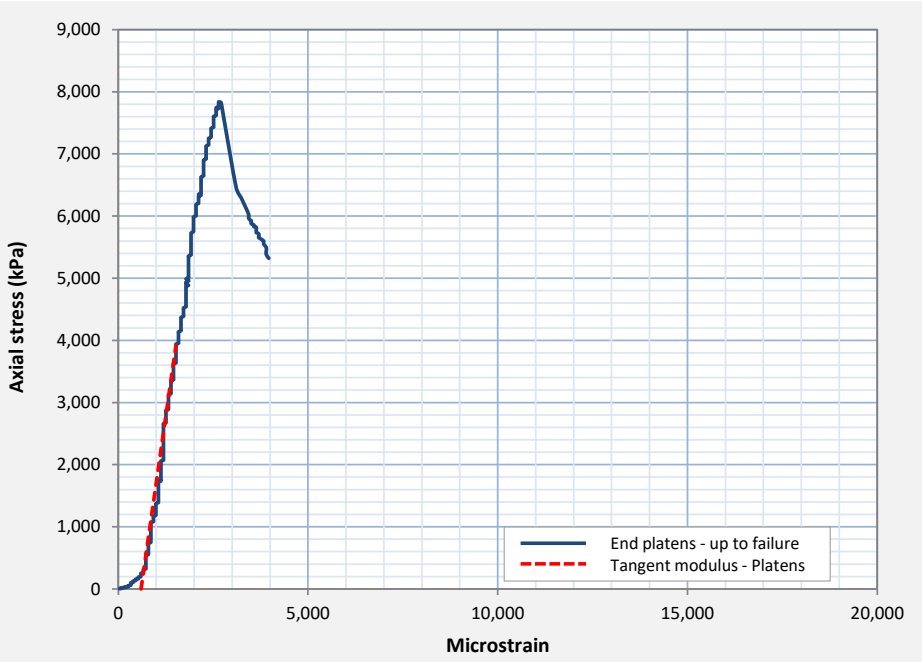
AS 4133.4.2.2-2013

GOLDER

Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093032	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			MELBOURNE GEOTECHNICAL LABORATORY	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	20145767-003	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-04**		**Sample depth (m):**	6.00 - 6.22
				Client sample ref:	GA20-BH04-007
Project reference:		**Loc. ref.:**	-		
Sample description:	SILTSTONE, brown			**Specimen mass (g):**	799.8
				Specimen height (mm):	151.3
Specimen history:	Specimen soaked for at least 24 hours prior to testing.			**Specimen diameter (mm):**	51.8
				Length diameter ratio (L:D):	2.9 : 1.0
Moisture content:	5.9% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*			**Density [as tested] (t/m^3):**	2.50
Machine ID:	GAMGL24.06	**Test apparatus:**	VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.36
		Date of test:	09/10/20	**Time at peak load:**	12:42:42 PM
		Time start of test:	12:32:53 PM	**Time to failure:**	9 mins 49 secs
		Rate of travel	0.040 mm/min		

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 4.3 GPa **Uniaxial Compressive Strength:** **7.8 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by diagonal shear approximately 70 degrees to horizontal

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** **14/10/20**

Cert. ref.: 20145767-003_GA20-BH-HAW-04_20093032_TRM20-0614_UCS.4.2.2_R20057566 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

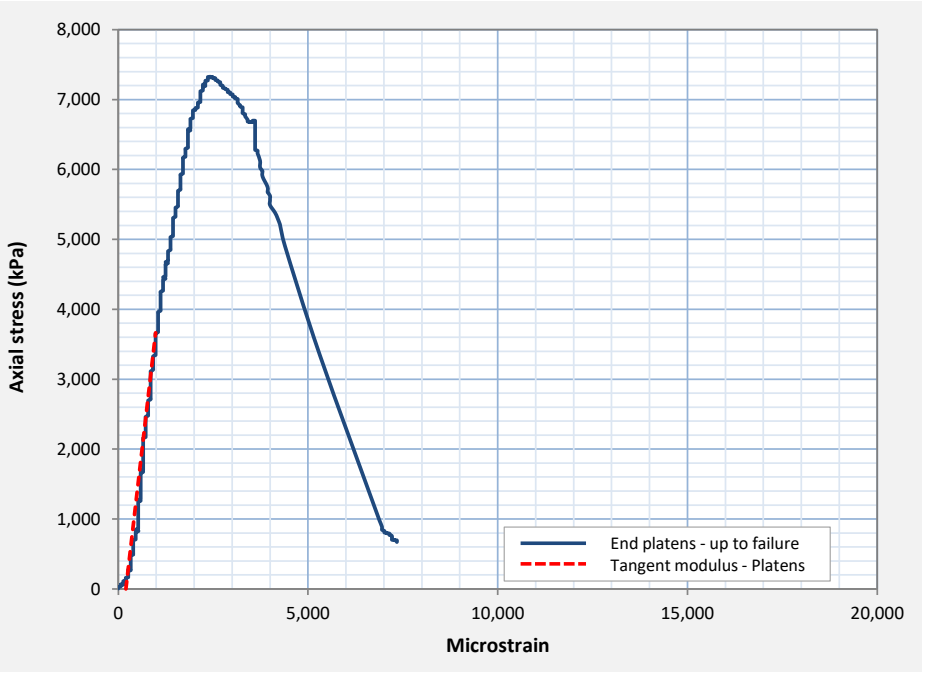
Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093035	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			MELBOURNE GEOTECHNICAL LABORATORY	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	20145767-003	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	GA20-BH-HAW-04		**Sample depth (m):**	9.72 - 9.93
				Client sample ref:	GA20-BH04-010
Project reference:		**Loc. ref.:**	-		

Sample description:	SILTSTONE, brown	**Specimen mass (g):**	801.5
Specimen history:	Specimen soaked for at least 24 hours prior to testing.	**Specimen height (mm):**	152.6
		Specimen diameter (mm):	51.7
		Length diameter ratio (L:D):	2.9 : 1.0
Moisture content:	6.1% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*	**Density [as tested] (t/m^3):**	2.50
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.35

Date of test:	09/10/20	**Rate of travel**		**Time at peak load:**	11:43:16 AM
Time start of test:	11:33:10 AM	0.040 mm/min		**Time to failure:**	10 mins 6 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 4.7 GPa **Uniaxial Compressive Strength:** **7.3 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by single cone shear with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** **14/10/20**

Cert. ref.: 20145767-003_GA20-BH-HAW-04_20093035_TRM20-0614_UCS.4.2.2_R20057567 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093046
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	20145767-003	**Exploratory Hole**	
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-05**	
Project reference:		**Loc. ref.:**	-

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Sample depth (m): 13.37 - 13.58

Client sample ref: GA20-BH05-012

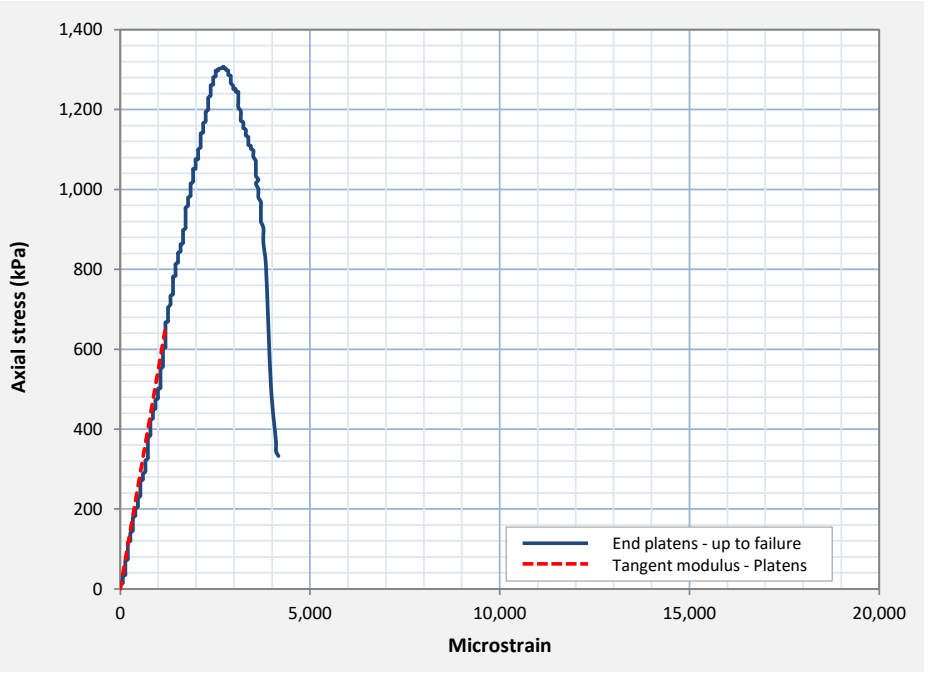
Sample description:	SILTSTONE, brown and pale brown with grey and red brown
Specimen history:	Specimen soaked for at least 24 hours prior to testing.
Moisture content:	8.5% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110

Specimen mass (g):	768.2
Specimen height (mm):	151.1
Specimen diameter (mm):	51.7
Length diameter ratio (L:D):	2.9 : 1.0
Density [as tested] (t/m^3):	2.42
Dry density (t/m^3):	2.23
Time at peak load:	11:02:47 AM
Time to failure:	5 mins 54 secs

Date of test:	09/10/20	**Rate of travel**	
Time start of test:	10:56:53 AM	0.070 mm/min	

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 0.5 GPa **Uniaxial Compressive Strength:** **1.3 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by diagonal shear approximately 75 degrees to horizontal with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** 14/10/20

Cert. ref.: 20145767-003_GA20-BH-HAW-05_20093046_TRM20-0614_UCS.4.2.2_R20057568 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093052
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	20145767-003	**Exploratory Hole**	
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-06**	
Project reference:		**Loc. ref.:**	-

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Sample depth (m): 10.33 - 10.51

Client sample ref: GA20-BH06-010

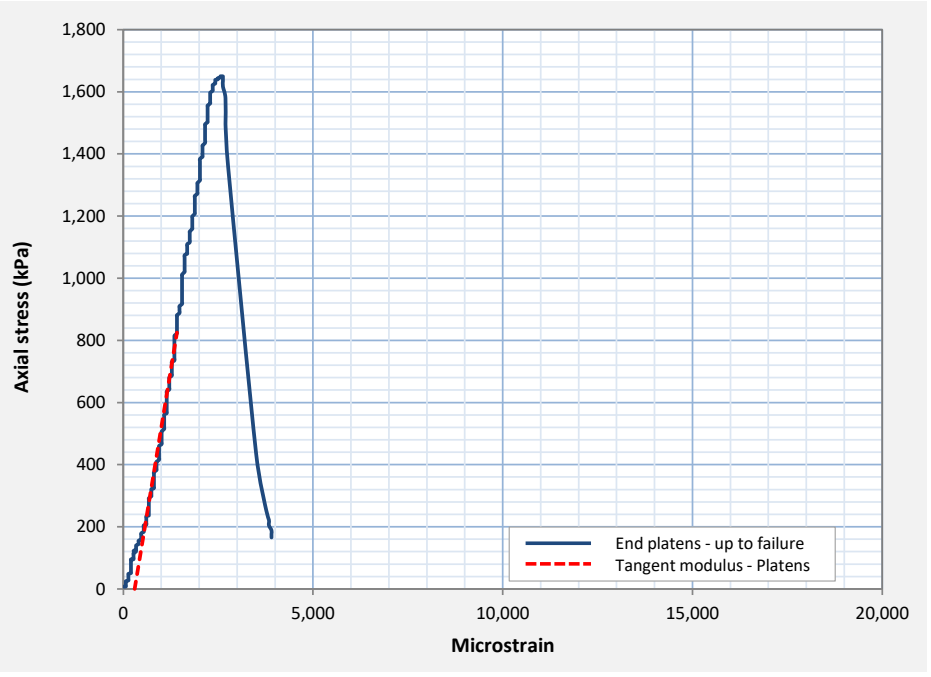
Sample description:	SILTSTONE, brown with red brown
Specimen history:	Specimen soaked for at least 24 hours prior to testing.
Moisture content:	8.0% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110

Specimen mass (g):	732.0
Specimen height (mm):	148.5
Specimen diameter (mm):	50.4
Length diameter ratio (L:D):	2.9 : 1.0
Density [as tested] (t/m^3):	2.47
Dry density (t/m^3):	2.29
Time at peak load:	10:53:13 AM
Time to failure:	5 mins 41 secs

Date of test:	09/10/20	**Rate of travel**	
Time start of test:	10:47:32 AM	0.070 mm/min	

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 0.7 GPa **Uniaxial Compressive Strength:** **1.6 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by diagonal shear approximately 55 degrees to horizontal through weakness plane

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** 14/10/20

Cert. ref.: 20145767-003_GA20-BH-HAW-06_20093052_TRM20-0614_UCS.4.2.2_R20057569 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093056
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	20145767-003	**Exploratory Hole**	
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	GA20-BH-HAW-07	
Project reference:		**Loc. ref.:**	-

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Sample depth (m): 6.58 - 6.76

Client sample ref: GA20-BH07-005

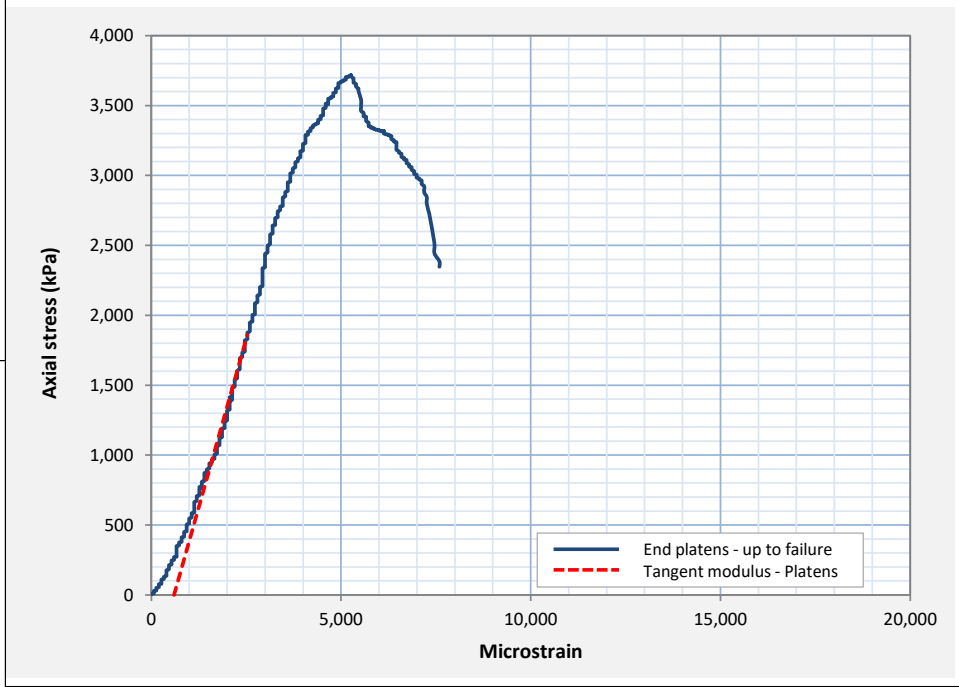
Sample description:	SILTSTONE, brown with grey
Specimen history:	Specimen soaked for at least 24 hours prior to testing.
Moisture content:	9.7% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110

Specimen mass (g):	759.0
Specimen height (mm):	150.1
Specimen diameter (mm):	51.8
Length diameter ratio (L:D):	2.9 : 1.0
Density [as tested] (t/m^3):	2.40
Dry density (t/m^3):	2.18
Time at peak load:	1:02:06 PM
Time to failure:	10 mins 51 secs

Date of test:	09/10/20	**Rate of travel**	
Time start of test:	12:51:15 PM	0.070 mm/min	

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 1 GPa **Uniaxial Compressive Strength:** **3.7 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by vertical shear with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** 14/10/20

Cert. ref.: 20145767-003_GA20-BH-HAW-07_20093056_TRM20-0614_UCS.4.2.2_R20057570 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

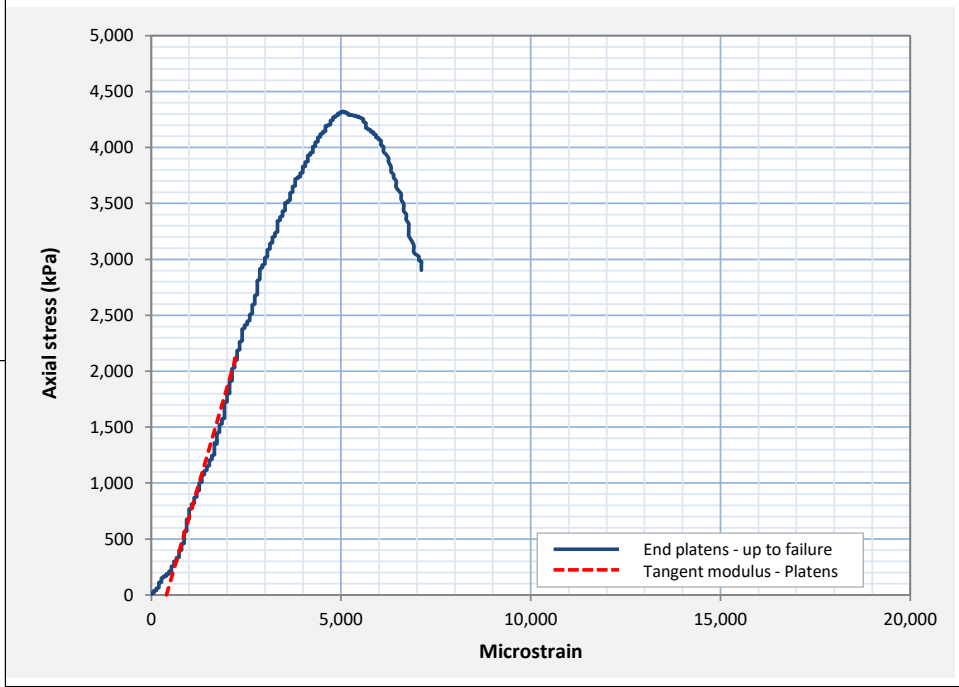
Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093058
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	20145767-003	**Exploratory Hole**	
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	GA20-BH-HAW-07	
Project reference:		**Loc. ref.:**	-
Sample description:	SILTSTONE, brown and pale brown		
Specimen history:	Specimen soaked for at least 24 hours prior to testing.		
Moisture content:	8.5% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*		
Machine ID:	GAMGL24.06	**Test apparatus:**	VJ Tech - VJT 5110

Sample depth (m):	8.00 - 8.20
Client sample ref:	GA20-BH07-007
Specimen mass (g):	769.2
Specimen height (mm):	150.3
Specimen diameter (mm):	51.9
Length diameter ratio (L:D):	2.9 : 1.0
Density [as tested] (t/m^3):	2.42
Dry density (t/m^3):	2.23
Time at peak load:	12:03:22 PM
Time to failure:	10 mins 32 secs

Date of test:	09/10/20	**Rate of travel**	
Time start of test:	11:52:50 AM	0.070 mm/min	

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 1.2 GPa **Uniaxial Compressive Strength:** **4.3 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by vertical shear with splitting

Definitions:

ND = Not determined

Sample prepared by:	AHS	**Test performed by:**	AHS
Results reviewed by:	AStevenson	**Date reported:**	**14/10/20**

Cert. ref.: 20145767-003_GA20-BH-HAW-07_20093058_TRM20-0614_UCS.4.2.2_R20057571 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)
Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

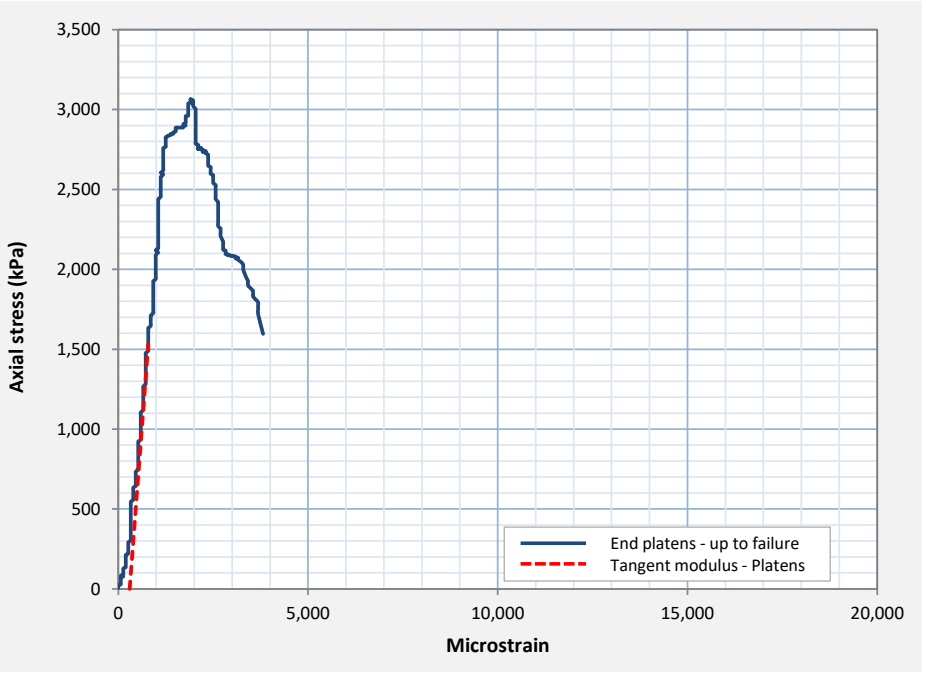
Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093064	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			MELBOURNE GEOTECHNICAL LABORATORY	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	20145767-003	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-08**		**Sample depth (m):**	7.22 - 7.40
				Client sample ref:	GA20-BH08-005
Project reference:		**Loc. ref.:**	-		

Sample description:	SILTSTONE, brown with pale brown	**Specimen mass (g):**	792.9
Specimen history:	Specimen soaked for at least 24 hours prior to testing.	**Specimen height (mm):**	152.0
		Specimen diameter (mm):	51.7
		Length diameter ratio (L:D):	2.9 : 1.0
Moisture content:	7.3% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*	**Density [as tested] (t/m^3):**	2.49
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.32

Date of test:	09/10/20	**Rate of travel**		**Time at peak load:**	11:20:07 AM
Time start of test:	11:14:17 AM	0.050 mm/min		**Time to failure:**	5 mins 50 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 3.1 GPa **Uniaxial Compressive Strength:** **3.1 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by vertical shear with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** 14/10/20

Cert. ref.: 20145767-003_GA20-BH-HAW-08_20093064_TRM20-0614_UCS.4.2.2_R20057572 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

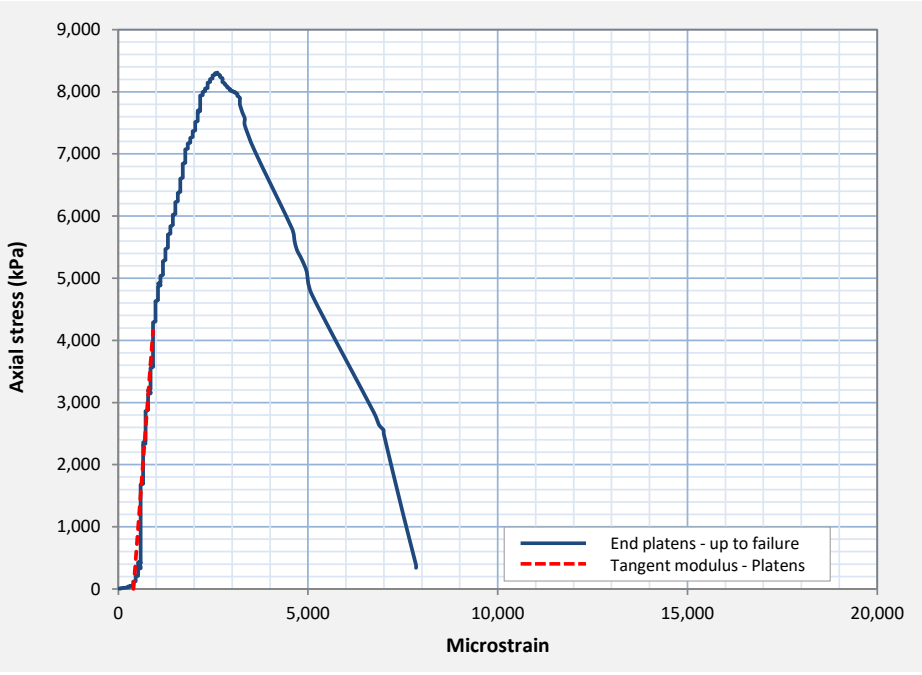
AS 4133.4.2.2-2013

GOLDER

Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093066	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			MELBOURNE GEOTECHNICAL LABORATORY	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	20145767-003	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-08**		**Sample depth (m):**	10.10 - 10.33
				Client sample ref:	GA20-BH08-008
Project reference:		**Loc. ref.:**	-		
Sample description:	SILTSTONE, brown and grey			**Specimen mass (g):**	802.8
Specimen history:	Specimen soaked for at least 24 hours prior to testing.			**Specimen height (mm):**	152.9
				Specimen diameter (mm):	51.5
				Length diameter ratio (L:D):	3.0 : 1.0
Moisture content:	6.3% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*			**Density [as tested] (t/m^3):**	2.52
Machine ID:	GAMGL24.06	**Test apparatus:**	VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.37
		Date of test:	08/10/20	**Rate of travel**	**Time at peak load:** 10:41:17 AM
		Time start of test:	10:30:15 AM	0.040 mm/min	**Time to failure:** 11 mins 2 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 8.1 GPa **Uniaxial Compressive Strength:** **8.3 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by single cone shear with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** **14/10/20**

Cert. ref.: 20145767-003_GA20-BH-HAW-08_20093066_TRM20-0614_UCS.4.2.2_R20057573 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093068
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	20145767-003	**Exploratory Hole**	
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-08**	
Project reference:		**Loc. ref.:**	-

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Sample depth (m): 13.03 - 13.23

Client sample ref: GA20-BH08-011

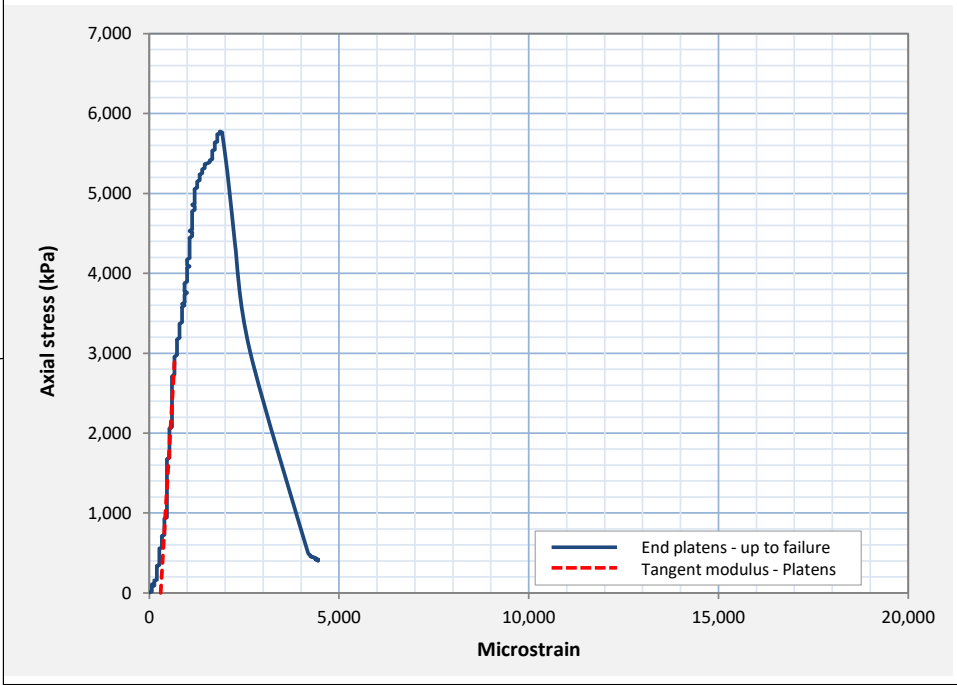
Sample description:	SILTSTONE, grey and brown
Specimen history:	Specimen soaked for at least 24 hours prior to testing.
Moisture content:	6.8% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110

Specimen mass (g):	780.0
Specimen height (mm):	150.6
Specimen diameter (mm):	51.5
Length diameter ratio (L:D):	2.9 : 1.0
Density [as tested] (t/m^3):	2.49
Dry density (t/m^3):	2.33
Time at peak load:	11:00:03 AM
Time to failure:	6 mins 51 secs

Date of test:	08/10/20	**Rate of travel**	
Time start of test:	10:53:12 AM	0.040 mm/min	

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 7.9 GPa **Uniaxial Compressive Strength:** **5.8 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by diagonal shear approximately 80 degrees to horizontal

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** 14/10/20

Cert. ref.: 20145767-003_GA20-BH-HAW-08_20093068_TRM20-0614_UCS.4.2.2_R20057574 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

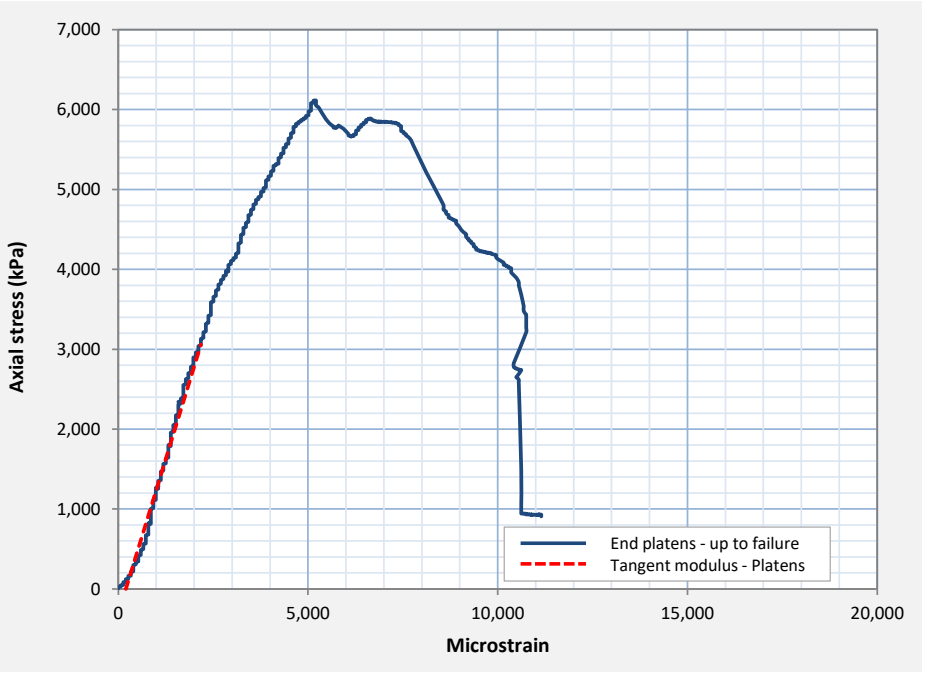
Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093073	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			MELBOURNE GEOTECHNICAL LABORATORY	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	20145767-003	**Exploratory Hole**			
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-10**		**Sample depth (m):**	6.30 - 6.53
				Client sample ref:	GA20-BH10-004
Project reference:		**Loc. ref.:**	-		

Sample description:	SILTSTONE, brown and grey	**Specimen mass (g):**	733.5
Specimen history:	Specimen soaked for at least 24 hours prior to testing.	**Specimen height (mm):**	151.6
		Specimen diameter (mm):	50.1
		Length diameter ratio (L:D):	3.0 : 1.0
Moisture content:	8.1% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*	**Density [as tested] (t/m^3):**	2.45
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110	**Dry density (t/m^3):**	2.27

Date of test:	08/10/20	**Rate of travel**		**Time at peak load:**	11:23:28 AM
Time start of test:	11:11:08 AM	0.060 mm/min		**Time to failure:**	12 mins 20 secs

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 1.5 GPa **Uniaxial Compressive Strength:** **6.1 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by single cone shear with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** **14/10/20**

Cert. ref.: 20145767-003_GA20-BH-HAW-10_20093073_TRM20-0614_UCS.4.2.2_R20057575 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL [PAGE 1 OF 1]

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

Test request #:	TRM20-0614	**Specimen ID:**	LMEL2020093077
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	20145767-003	**Exploratory Hole**	
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-10**	
Project reference:		**Loc. ref.:**	-

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

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Richmond, Victoria 3121

Sample depth (m): 12.26 - 12.42

Client sample ref: GA20-BH10-010

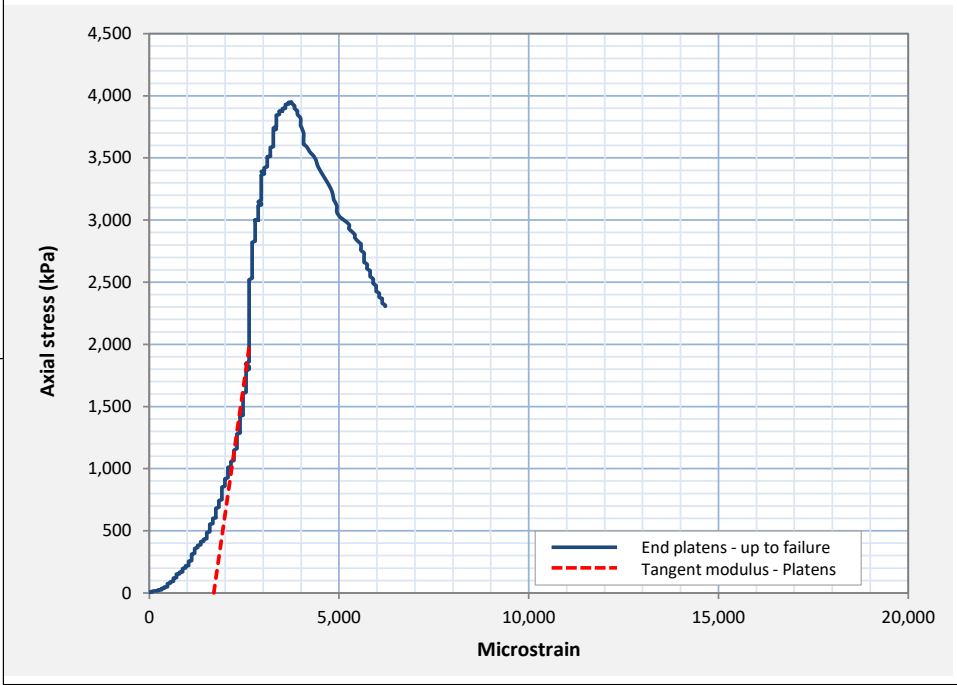
Sample description:	SILTSTONE, brown and grey
Specimen history:	Specimen soaked for at least 24 hours prior to testing.
Moisture content:	7.4% **Soaked** *(In accordance with AS 4133.1.1.1-2005)*
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110

Specimen mass (g):	628.4
Specimen height (mm):	125.4
Specimen diameter (mm):	51.0
Length diameter ratio (L:D):	2.5 : 1.0
Density [as tested] (t/m^3):	2.45
Dry density (t/m^3):	2.28
Time at peak load:	6:51:23 AM
Time to failure:	8 mins 42 secs

Date of test:	12/10/20	**Rate of travel**	
Time start of test:	6:42:41 AM	0.050 mm/min	

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 2.1 GPa **Uniaxial Compressive Strength:** **4 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by vertical shear with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** 14/10/20

Cert. ref.: 20145767-003_GA20-BH-HAW-10_20093077_TRM20-0614_UCS.4.2.2_R20057576 **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rock testing - Determination of the Uniaxial Compressive Strength

Rock strength less than 50 MPa

AS 4133.4.2.2-2013

GOLDER

Test request #:	**TRM20-0614**	**Specimen ID:**	**LMEL2020093083**
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	**20145767-003**	**Exploratory Hole**	
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**GA20-BH-HAW-11**	
Project reference:		**Loc. ref.:**	-

Golder Associates Pty Ltd

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570 - 588 Swan Street
Richmond, Victoria 3121

Sample depth (m): 7.24 - 7.45

Client sample ref: GA20-BH11-009

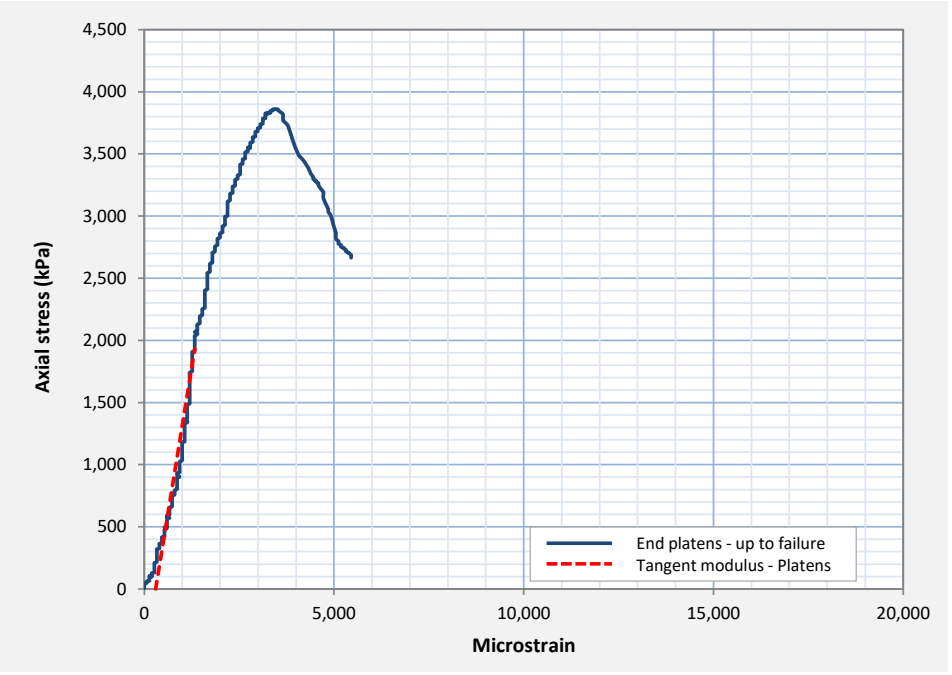
Sample description:	SILTSTONE, brown and grey
Specimen history:	Specimen soaked for at least 24 hours prior to testing.
Moisture content:	**10.2%** **Soaked** *(In accordance with AS 4133.1.1.1-2005)*
Machine ID:	GAMGL24.06 **Test apparatus:** VJ Tech - VJT 5110

Specimen mass (g):	755.3
Specimen height (mm):	150.4
Specimen diameter (mm):	51.7
Length diameter ratio (L:D):	2.9 : 1.0
Density [as tested] (t/m^3):	2.39
Dry density (t/m^3):	2.17
Time at peak load:	9:52:31 AM
Time to failure:	8 mins 57 secs

Date of test:	08/10/20	**Rate of travel**	
Time start of test:	9:43:34 AM	0.060 mm/min	

Specimen preparation: Core cut on diamond saw. Critical dimensions checked using verniers, 0.02 mm feeler gauge, dial gauge and square.

Preparation of specimens and testing performed on samples supplied to the laboratory



Tangent platen modulus*: 1.9 GPa **Uniaxial Compressive Strength:** **3.9 MPa**

**Inferred at 50% of peak axial stress (using end platen strain)*

Mode of failure: Failure by vertical shear with splitting

Definitions:

ND = Not determined

Sample prepared by: AHS **Test performed by:** AHS

Results reviewed by: AStevenson **Date reported:** **14/10/20**

Cert. ref.: **20145767-003_GA20-BH-HAW-11_20093083_TRM20-0614_UCS.4.2.2_R20057577** **Approved signatory:**

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

Aaron Stevenson - Senior Technician

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This test was carried out in accordance with AS 4133.4.2.2-2013 with the exception of the following clause: 4.2a(iv)

Test results relate only to the specimens tested

Rocks testing - Determination of point load strength index

Including tests on; Axial (**A**), Diametral (**D**) or irregular Lump (**L**) specimens

AS 4133.4.1-2007

TEST REPORT - SUMMARY OF ANALYSIS

GOLDER

Test request ID:	**TRM20-0614**	**Lab sample IDs:**	20093019 - 20093021	**Lab report ref.:**	LMEL_20057555
Client:	Hayball Pty Ltd			**Project reference:**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			**Location:**	Hawthorn
Project ID:	**20145767-003**	**Project name:**	**Public Housing Renewal Project 1-7 Bills Street, Hawthorn**		

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MELBOURNE GEOTECHNICAL LABORATORY
Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-03	5.36 5.52	GA20-BH03-003	Test type:	D									
			**Compliant test:	Yes									
Lab sample ID	LMEL2020093019		Failure mode	W									
Sampling By	Date:		Failure load [kN]	0.32									
	Method:	-	Defect orientation	35°									
Moisture content	8.9%		Is [MPa]	0.15									
Moisture content type:	Soaked		$Is_{(50)}$ [MPa]	0.15									
Density (t/m³)	As received	Dry	Lithological description	SILTSTONE, brown									
	ND	ND											

Location test conducted: Laboratory

Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*

	Axial	Diametral	Irregular
		0.32	
	-	-	-
		0.15	
		0.15	

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.

Client ref.:

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-03	7.92 8.00	GA20-BH03-005	Test type:	D									
			**Compliant test:	Yes									
Lab sample ID	LMEL2020093021		Failure mode	W									
Sampling By	Date:		Failure load [kN]	0.13									
	Method:	-	Defect orientation	45°									
Moisture content	11.2%		Is [MPa]	0.053									
Moisture content type:	Soaked		$Is_{(50)}$ [MPa]	0.053									
Density (t/m³)	As received	Dry	Lithological description	SILTSTONE, brown									
	ND	ND											

Location test conducted: Laboratory

Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*

	Axial	Diametral	Irregular
		0.13	
	-	-	-
		0.053	
		0.053	

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.

Client ref.:

Definitions:

Test types: A = Axial, **D** = Diametral, **L** = Lump / Irregular

n/a = Not applicable, **ND** = Not determined

Failure modes: B = Along bedding plane, **M** = Through rock matrix, **J** = Along joint, **W** = Along a plane of weakness, **DF** = Didn't Fail

****** A non compliant test = platen gap at failure being outside of the tolerance of the method

Cert. ref.:	**20145767-003_TRM20-0614_PtLd_20093019 - 20093021_Rep-20057555**	**Specimens prepared by:**	AHS
NATA	**NATA accreditation number: 1961 - Site:1250 - Melbourne**	**Tests performed by:**	AHS 12/10/20
	Accredited for compliance with ISO/IEC 17025 - Testing	**Results reviewed by:**	AStevenson
	THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL	**Date reported:**	**14/10/2020**

Approved signatory:

Aaron Stevenson - Senior Technician

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Rocks testing - Determination of point load strength index

Including tests on; Axial (**A**), Diametral (**D**) or irregular Lump (**L**) specimens

AS 4133.4.1-2007

TEST REPORT - SUMMARY OF ANALYSIS

GOLDER

Test request ID:	TRM20-0614	**Lab sample IDs:**	20093042 - 20093043	**Lab report ref.:**	LMEL_20057556
Client:	Hayball Pty Ltd			**Project reference:**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			**Location:**	Hawthorn
Project ID:	20145767-003	**Project name:**	Public Housing Renewal Project 1-7 Bills Street, Hawthorn		

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MELBOURNE GEOTECHNICAL LABORATORY
Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-05	9.86 10.00	GA20-BH05-008	Test type:	D									
			**Compliant test:	Yes									
Lab sample ID	LMEL2020093042		Failure mode	W									
Sampling By:	Date:		Failure load [kN]	0.22									
	Method:	-	Defect orientation	70°									
Moisture content	11.1%		Is [MPa]	0.094									
Moisture content type:	Soaked		$Is_{(50)}$ [MPa]	0.092									
Density (t/m³)	As received	Dry	Lithological description	SILTSTONE, brown and grey							History:		
	ND	ND									Client ref.:		

Location test conducted: Laboratory

Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*

	Axial	Diametral	Irregular
		0.22	
	-	-	-
		0.094	
		0.092	

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-05	10.27 10.39	GA20-BH05-009	Test type:	D									
			**Compliant test:	Yes									
Lab sample ID	LMEL2020093043		Failure mode	W									
Sampling By:	Date:		Failure load [kN]	0.15									
	Method:	-	Defect orientation	65°									
Moisture content	12.2%		Is [MPa]	0.068									
Moisture content type:	Soaked		$Is_{(50)}$ [MPa]	0.066									
Density (t/m³)	As received	Dry	Lithological description	SILTSTONE, brown and grey							History:		
	ND	ND									Client ref.:		

Location test conducted: Laboratory

Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*

	Axial	Diametral	Irregular
		0.15	
	-	-	-
		0.068	
		0.066	

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.

Definitions:

Test types: A = Axial, **D** = Diametral, **L** = Lump / Irregular

n/a = Not applicable, **ND** = Not determined

Failure modes: B = Along bedding plane, **M** = Through rock matrix, **J** = Along joint, **W** = Along a plane of weakness, **DF** = Didn't Fail

****** A non compliant test = platen gap at failure being outside of the tolerance of the method

Cert. ref.:	20145767-003_TRM20-0614_PtLd_20093042 - 20093043_Rep-20057556	**Specimens prepared by:**	AHS
NATA	**NATA accreditation number: 1961 - Site:1250 - Melbourne**	**Tests performed by:**	AHS 12/10/20
	Accredited for compliance with ISO/IEC 17025 - Testing	**Results reviewed by:**	AStevenson
	THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL	**Date reported:**	**14/10/2020**

Approved signatory:

Aaron Stevenson - Senior Technician

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Rocks testing - Determination of point load strength index

Including tests on; Axial (**A**), Diametral (**D**) or irregular Lump (**L**) specimens

AS 4133.4.1-2007

TEST REPORT - SUMMARY OF ANALYSIS

GOLDER

Test request ID:	TRM20-0614	**Lab sample IDs:**	20093048 - 20093050	**Lab report ref.:**	LMEL_20057557
Client:	Hayball Pty Ltd			**Project reference:**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			**Location:**	Hawthorn
Project ID:	20145767-003	**Project name:**	Public Housing Renewal Project 1-7 Bills Street, Hawthorn		

Golder Associates Pty Ltd
MELBOURNE GEOTECHNICAL LABORATORY
Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-06	6.75 6.92	GA20-BH06-006	Test type:	D									
			**Compliant test:	Yes									
Lab sample ID	LMEL2020093048		Failure mode	W									
Sampling By:	Date:		Failure load [kN]	0.31									
	Method:	-	Defect orientation	75°									
Moisture content	11.1%		Is [MPa]	0.14									
Moisture content type:	Soaked		$Is_{(50)}$ [MPa]	0.14									
Density (t/m³)	As received	Dry	Lithological description	SILTSTONE, brown and grey									
	ND	ND											

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.
Client ref.:

Location test conducted: Laboratory

Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*

	Axial	Diametral	Irregular
		0.31	
	-	-	-
		0.14	
		0.14	

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-06	8.08 8.20	GA20-BH06-008	Test type:	D									
			**Compliant test:	Yes									
Lab sample ID	LMEL2020093050		Failure mode	W									
Sampling By:	Date:		Failure load [kN]	0.9									
	Method:	-	Defect orientation	25°									
Moisture content	10.1%		Is [MPa]	0.44									
Moisture content type:	Soaked		$Is_{(50)}$ [MPa]	0.42									
Density (t/m³)	As received	Dry	Lithological description	SILTSTONE, brown and grey									
	ND	ND											

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.
Client ref.:

Location test conducted: Laboratory

Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*

	Axial	Diametral	Irregular
		0.9	
	-	-	-
		0.44	
		0.42	

Definitions:

Test types: A = Axial, **D** = Diametral, **L** = Lump / Irregular

n/a = Not applicable, **ND** = Not determined

Failure modes: B = Along bedding plane, **M** = Through rock matrix, **J** = Along joint, **W** = Along a plane of weakness, **DF** = Didn't Fail

****** A non compliant test = platen gap at failure being outside of the tolerance of the method

Cert. ref.:	20145767-003_TRM20-0614_PtLd_20093048 - 20093050_Rep-20057557	**Specimens prepared by:**	AHS
NATA	**NATA accreditation number: 1961 - Site:1250 - Melbourne**	**Tests performed by:**	AHS 12/10/20
	Accredited for compliance with ISO/IEC 17025 - Testing	**Results reviewed by:**	AStevenson
	THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL	**Date reported:**	**14/10/2020**

Approved signatory:

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Rocks testing - Determination of point load strength index

Including tests on; Axial (**A**), Diametral (**D**) or irregular Lump (**L**) specimens

AS 4133.4.1-2007

TEST REPORT - SUMMARY OF ANALYSIS

GOLDER

Test request ID:	**TRM20-0614**	**Lab sample IDs:**	20093079 - 20093090	**Lab report ref.:**	LMEL_20057558
Client:	Hayball Pty Ltd			**Project reference:**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			**Location:**	Hawthorn
Project ID:	**20145767-003**	**Project name:**	**Public Housing Renewal Project 1-7 Bills Street, Hawthorn**		

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Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-11	**3.00** **3.13**	**GA20-BH11-005**	**Test type:**	**D**									
			****Compliant test:**	**Yes**									
Lab sample ID	**LMEL2020093079**		**Failure mode**	W									
Sampling **By**		**Date:**	**Failure load [kN]**	1.2									
		Method: -	**Defect orientation**	70°									
Moisture content	**8.8%**		**Is [MPa]**	0.51									
Moisture content type:	**Soaked**		**$Is_{(50)}$ [MPa]**	0.5									
Density (t/m³)	**As received**	**Dry**	**Lithological description**	SILTSTONE, brown and grey									
	ND	**ND**											

Location test conducted:	Laboratory
Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*	

	Axial	**Diametral**	**Irregular**
		1.2	
	-	-	-
		0.51	
		0.5	

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.
Client ref.:

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-12	**9.62** **9.74**	**GA20-BH12-006**	**Test type:**	**D**									
			****Compliant test:**	**Yes**									
Lab sample ID	**LMEL2020093090**		**Failure mode**	W									
Sampling **By**		**Date:**	**Failure load [kN]**	0.67									
		Method: -	**Defect orientation**	50°									
Moisture content	**3.5%**		**Is [MPa]**	0.27									
Moisture content type:	**As rcvd.**		**$Is_{(50)}$ [MPa]**	0.27									
Density (t/m³)	**As received**	**Dry**	**Lithological description**	SILTSTONE, grey and brown									
	ND	**ND**											

Location test conducted:	Laboratory
Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*	

	Axial	**Diametral**	**Irregular**
		0.67	
	-	-	-
		0.27	
		0.27	

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.
Client ref.:

Definitions:
Test types: A = Axial, **D** = Diametral, **L** = Lump / Irregular
n/a = Not applicable, **ND** = Not determined
Failure modes: B = Along bedding plane, **M** = Through rock matrix, **J** = Along joint, **W** = Along a plane of weakness, **DF** = Didn't Fail
****** A non compliant test = platen gap at failure being outside of the tolerance of the method

Cert. ref.:	**20145767-003_TRM20-0614_PtLd_20093079 - 20093090_Rep-20057558**	**Specimens prepared by:**	AHS
NATA	**NATA accreditation number: 1961 - Site:1250 - Melbourne**	**Tests performed by:**	AHS 12/10/20
	Accredited for compliance with ISO/IEC 17025 - Testing	**Results reviewed by:**	AStevenson
	THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL	**Date reported:**	**14/10/2020**

Approved signatory:

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Rocks testing - Determination of point load strength index

Including tests on; Axial (**A**), Diametral (**D**) or irregular Lump (**L**) specimens

AS 4133.4.1-2007

TEST REPORT - SUMMARY OF ANALYSIS

GOLDER

Test request ID:	**TRM20-0614**	**Lab sample IDs:**	20093094 - 20093088	**Lab report ref.:**	LMEL_20057559
Client:	Hayball Pty Ltd			**Project reference:**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			**Location:**	Hawthorn
Project ID:	**20145767-003**	**Project name:**	**Public Housing Renewal Project 1-7 Bills Street, Hawthorn**		

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MELBOURNE GEOTECHNICAL LABORATORY
Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-12	**14.79**	**GA20-BH12-**	**Test type:**	**D**									
	14.91	**011**	****Compliant test:**	**Yes**									
Lab sample ID	**LMEL2020093094**		**Failure mode**	W									
Sampling **By**		**Date:**	**Failure load [kN]**	0.54									
		Method: -	**Defect orientation**	45°									
Moisture content	**10.5%**		**Is [MPa]**	0.27									
Moisture content type:	**As rcvd.**		**$Is_{(50)}$ [MPa]**	0.25									
Density (t/m³)	**As received**	**Dry**	**Lithological description**	SILTSTONE, grey and brown									
	ND	**ND**											

Location test conducted:	Laboratory

Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*

	Axial	**Diametral**	**Irregular**
		0.54	
	-	-	-
		0.27	
		0.25	

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.

Client ref.:

Exploratory hole reference	Sample depth (m)	Specimen reference	Sub-specimen:	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
GA20-BH-HAW-12	**16.90**	**GA20-BH12-**	**Test type:**	**D**									
	17.00	**014**	****Compliant test:**	**Yes**									
Lab sample ID	**LMEL2020093088**		**Failure mode**	W									
Sampling **By**		**Date:**	**Failure load [kN]**	0.55									
		Method: -	**Defect orientation**	50°									
Moisture content	**8.4%**		**Is [MPa]**	0.24									
Moisture content type:	**As rcvd.**		**$Is_{(50)}$ [MPa]**	0.23									
Density (t/m³)	**As received**	**Dry**	**Lithological description**	SILTSTONE, grey and pale grey									
	ND	**ND**											

Location test conducted:	Laboratory

Mean values: *Calculation excludes specimens which are not compliant with the tolerances specified in the test method*

	Axial	**Diametral**	**Irregular**
		0.55	
	-	-	-
		0.24	
		0.23	

History: Test performed on samples submitted to the laboratory. Soaked for at least 24 hours.

Client ref.:

Definitions:

Test types: A = Axial, **D** = Diametral, **L** = Lump / Irregular

n/a = Not applicable, **ND** = Not determined

Failure modes: B = Along bedding plane, **M** = Through rock matrix, **J** = Along joint, **W** = Along a plane of weakness, **DF** = Didn't Fail

****** A non compliant test = platen gap at failure being outside of the tolerance of the method

Cert. ref.:	**20145767-003_TRM20-0614_PtLd_20093094 - 20093088_Rep-20057559**	**Specimens prepared by:**	AHS
NATA	**NATA accreditation number: 1961 - Site:1250 - Melbourne**	**Tests performed by:**	AHS 12/10/20
	Accredited for compliance with ISO/IEC 17025 - Testing	**Results reviewed by:**	AStevenson
	THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL	**Date reported:**	**14/10/2020**

Approved signatory:

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Rock testing - Determination of the moisture content of rock

Oven drying method (standard method)

AS 4133.1.1.1-2005

GOLDER

Test request ID:	**TRM20-0614**	**Lab sample IDs:**	2009300-20093024
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	**20145767-003**	**Lab report ref.:**	LMEL_20057551

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park

570 - 588 Swan Street

Richmond, Victoria 3121

Project name: Public Housing Renewal Project 1-7 Bills Street, Hawthorn

Location: Hayball Pty Ltd

Client Reference:

TEST REPORT - SUMMARY OF ANALYSIS

Lab sample ID	Exploratory hole ref.	Sample depth (m)	Specimen reference	Specimen / lithological description	Moisture content
LMEL202009300	GA20-BH-HAW-01	5.74	GA20-BH01-004	SILTSTONE, brown	6.8%
		5.93			Soaked
LMEL202009302	GA20-BH-HAW-01	8.35	GA20-BH01-007	SILTSTONE, brown	11.3%
		8.46			Soaked
LMEL202009304	GA20-BH-HAW-01	10.70	GA20-BH01-009	SILTSTONE, brown	8.5%
		10.92			Soaked
LMEL202009305	GA20-BH-HAW-01	12.40	GA20-BH01-011	SILTSTONE, brown and dark brown	5.8%
		12.49			Soaked
LMEL202009307	GA20-BH-HAW-01	14.38	GA20-BH01-013	SILTSTONE, grey with brown	5.5%
		14.57			Soaked
LMEL202009308	GA20-BH-HAW-02	3.85	GA20-BH02-003	SILTSTONE, brown	9.8%
		4.00			Soaked
LMEL2020093010	GA20-BH-HAW-02	5.80	GA20-BH02-005	SILTSTONE, brown	9.6%
		6.00			Soaked
LMEL2020093012	GA20-BH-HAW-02	7.20	GA20-BH02-007	SILTSTONE, brown with grey	8.5%
		7.40			Soaked
LMEL2020093013	GA20-BH-HAW-02	8.20	GA20-BH02-008	SILTSTONE, brown and grey	7.7%
		8.35			Soaked
LMEL2020093015	GA20-BH-HAW-02	11.25	GA20-BH02-011	SILTSTONE, brown and grey	7.6%
		11.38			Soaked
LMEL2020093016	GA20-BH-HAW-02	13.28	GA20-BH02-013	SILTSTONE, brown with grey	7.4%
		13.45			Soaked
LMEL2020093017	GA20-BH-HAW-02	14.60	GA20-BH02-014	SILTSTONE, brown with grey	6.9%
		14.70			Soaked
LMEL2020093018	GA20-BH-HAW-03	4.76	GA20-BH03-002	SILTSTONE, brown	10.8%
		4.88			Soaked
LMEL2020093020	GA20-BH-HAW-03	6.43	GA20-BH03-004	SILTSTONE, brown	9.5%
		6.58			Soaked
LMEL2020093022	GA20-BH-HAW-03	8.23	GA20-BH03-006	SILTSTONE, brown with grey	10.7%
		8.35			Soaked
LMEL2020093023	GA20-BH-HAW-03	9.84	GA20-BH03-007	SILTSTONE, brown with grey	12.8%
		9.90			Soaked
LMEL2020093024	GA20-BH-HAW-03	10.85	GA20-BH03-008	SILTSTONE, grey brown	14.9%
		10.93			Soaked

Definitions:

ND = Not determined

Specimen prepared by: AHS

Result reviewed by: AStevenson

Test performed by: NMD/LM

Date reported: **14/10/2020**

Cert. ref.: **20145767-003_TRM20-0614_RMC_2009300-20093024_Rep-20057551**

Approved signatory:

NATA accreditation number: 1961 - Site:1250 - Melbourne

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Rock testing - Determination of the moisture content of rock

Oven drying method (standard method)

AS 4133.1.1.1-2005

GOLDER

Test request ID:	**TRM20-0614**	**Lab sample IDs:**	20093025-20093045
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	**20145767-003**	**Lab report ref.:**	LMEL_20057552

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park

570 - 588 Swan Street

Richmond, Victoria 3121

Project name: Public Housing Renewal Project 1-7 Bills Street, Hawthorn

Location: Hayball Pty Ltd

Client Reference:

TEST REPORT - SUMMARY OF ANALYSIS

Lab sample ID	Exploratory hole ref.	Sample depth (m)	Specimen reference	Specimen / lithological description	Moisture content
LMEL2020093025	GA20-BH-HAW-03	11.18	GA20-BH03-009	SILTSTONE, pale grey and pale brown	13.4%
		11.28			Soaked
LMEL2020093026	GA20-BH-HAW-03	12.70	GA20-BH03-010	SILTSTONE, grey brown	13.6%
		12.83			Soaked
LMEL2020093027	GA20-BH-HAW-03	13.87	GA20-BH03-011	SILTSTONE, grey with brown	12.7%
		14.00			Soaked
LMEL2020093028	GA20-BH-HAW-03	14.12	GA20-BH03-012	SILTSTONE, brown	11.4%
		14.21			Soaked
LMEL2020093029	GA20-BH-HAW-03	15.13	GA20-BH03-013	SILTSTONE, grey brown	13.7%
		15.22			Soaked
LMEL2020093030	GA20-BH-HAW-04	4.60	GA20-BH04-005	SILTSTONE, brown with grey	10.6%
		4.70			Soaked
LMEL2020093031	GA20-BH-HAW-04	5.73	GA20-BH04-006	SILTSTONE, brown	6.9%
		5.85			Soaked
LMEL2020093033	GA20-BH-HAW-04	7.71	GA20-BH04-008	SILTSTONE, brown with grey	6.3%
		7.90			Soaked
LMEL2020093034	GA20-BH-HAW-04	8.63	GA20-BH04-009	SILTSTONE, grey brown	6.3%
		8.82			Soaked
LMEL2020093036	GA20-BH-HAW-04	11.78	GA20-BH04-012	SILTSTONE, grey brown	6.7%
		12.00			Soaked
LMEL2020093037	GA20-BH-HAW-04	13.40	GA20-BH04-014	SILTSTONE, grey	6.6%
		13.60			Soaked
LMEL2020093038	GA20-BH-HAW-04	15.23	GA20-BH04-016	SILTSTONE, brown grey	6.2%
		15.35			Soaked
LMEL2020093039	GA20-BH-HAW-05	5.92	GA20-BH05-005	SILTSTONE, pale grey brown	5.7%
		6.00			Soaked
LMEL2020093040	GA20-BH-HAW-05	7.10	GA20-BH05-006	SILTSTONE, brown	4.4%
		7.15			Soaked
LMEL2020093041	GA20-BH-HAW-05	8.28	GA20-BH05-007	SILTSTONE, pale brown and brown	11.2%
		8.38			Soaked
LMEL2020093044	GA20-BH-HAW-05	11.04	GA20-BH05-010	SILTSTONE, pale grey brown	10.1%
		11.18			Soaked
LMEL2020093045	GA20-BH-HAW-05	12.00	GA20-BH05-011	SILTSTONE, grey and brown	9.4%
		12.10			Soaked

Definitions:

ND = Not determined

Specimen prepared by: AHS

Result reviewed by: AStevenson

Test performed by: NMD/LM

Date reported: **14/10/2020**

Cert. ref.: **20145767-003_TRM20-0614_RMC_20093025-20093045_Rep-20057552**

Approved signatory:

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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Rock testing - Determination of the moisture content of rock

Oven drying method (standard method)

AS 4133.1.1.1-2005

GOLDER

Test request ID:	**TRM20-0614**	**Lab sample IDs:**	20093047-20093071
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	**20145767-003**	**Lab report ref.:**	LMEL_20057553

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park

570 - 588 Swan Street

Richmond, Victoria 3121

Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**Location:**	Hayball Pty Ltd
		Client Reference:	

TEST REPORT - SUMMARY OF ANALYSIS

Lab sample ID	Exploratory hole ref.	Sample depth (m)	Specimen reference	Specimen / lithological description	Moisture content
LMEL2020093047	GA20-BH-HAW-05	14.88	GA20-BH05-013	SILTSTONE, grey and brown	7.8%
		15.00			Soaked
LMEL2020093049	GA20-BH-HAW-06	7.80	GA20-BH06-007	SILTSTONE, brown	9.9%
		7.90			Soaked
LMEL2020093051	GA20-BH-HAW-06	9.08	GA20-BH06-009	SILTSTONE, brown	6.5%
		9.24			Soaked
LMEL2020093053	GA20-BH-HAW-06	12.23	GA20-BH06-012	SILTSTONE, brown and pale brown	4.4%
		12.36			Soaked
LMEL2020093054	GA20-BH-HAW-06	13.20	GA20-BH06-013	SILTSTONE, brown	5.0%
		13.32			Soaked
LMEL2020093055	GA20-BH-HAW-07	5.71	GA20-BH07-004	SILTSTONE, brown	9.7%
		5.90			Soaked
LMEL2020093057	GA20-BH-HAW-07	7.76	GA20-BH07-006	SILTSTONE, brown and red brown	7.4%
		7.92			Soaked
LMEL2020093059	GA20-BH-HAW-07	10.11	GA20-BH07-009	SILTSTONE, brown	10.8%
		10.25			Soaked
LMEL2020093060	GA20-BH-HAW-07	11.25	GA20-BH07-010	SILTSTONE, brown	7.2%
		11.40			Soaked
LMEL2020093061	GA20-BH-HAW-07	12.05	GA20-BH07-011	SILTSTONE, brown	8.8%
		12.23			Soaked
LMEL2020093062	GA20-BH-HAW-07	13.14	GA20-BH07-012	SILTSTONE, grey and brown	4.2%
		13.34			Soaked
LMEL2020093063	GA20-BH-HAW-07	14.50	GA20-BH07-014	SILTSTONE, grey	4.5%
		14.63			Soaked
LMEL2020093065	GA20-BH-HAW-08	9.13	GA20-BH08-007	SILTSTONE, brown	6.8%
		9.21			Soaked
LMEL2020093067	GA20-BH-HAW-08	11.72	GA20-BH08-009	SILTSTONE, brown	5.7%
		11.84			Soaked
LMEL2020093069	GA20-BH-HAW-09	11.90	GA20-BH09-006	SILTSTONE, grey and brown	5.3%
		11.95			Soaked
LMEL2020093070	GA20-BH-HAW-09	12.20	GA20-BH09-007	SILTSTONE, brown and dark brown	8.0%
		12.26			Soaked
LMEL2020093071	GA20-BH-HAW-09	13.10	GA20-BH09-008	SILTSTONE, brown and dark brown	5.5%
		13.18			Soaked

Definitions:

ND = Not determined

Specimen prepared by: AHS **Test performed by:** NMD/LM

Result reviewed by: AStevenson **Date reported:** **14/10/2020**

Cert. ref.:	**20145767-003_TRM20-0614_RMC_20093047-20093071_Rep-20057553**	**Approved signatory:**
NATA	**NATA accreditation number: 1961 - Site:1250 - Melbourne** Accredited for compliance with ISO/IEC 17025 - Testing	
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Rock testing - Determination of the moisture content of rock

Oven drying method (standard method)

AS 4133.1.1.1-2005

GOLDER

Test request ID:	**TRM20-0614**	**Lab sample IDs:**	20093072-20093093
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	**20145767-003**	**Lab report ref.:**	LMEL_20057554

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park

570 - 588 Swan Street

Richmond, Victoria 3121

Project name: Public Housing Renewal Project 1-7 Bills Street, Hawthorn

Location: Hayball Pty Ltd

Client Reference:

TEST REPORT - SUMMARY OF ANALYSIS

Lab sample ID	Exploratory hole ref.	Sample depth (m)	Specimen reference	Specimen / lithological description	Moisture content
LMEL2020093072	GA20-BH-HAW-09	15.77	GA20-BH09-009	SILTSTONE, brown and grey	8.8%
		15.87			Soaked
LMEL2020093074	GA20-BH-HAW-10	7.71	GA20-BH10-005	SILTSTONE, brown and grey	7.8%
		7.93			Soaked
LMEL2020093075	GA20-BH-HAW-10	9.00	GA20-BH10-007	SILTSTONE, brown grey	7.3%
		9.25			Soaked
LMEL2020093076	GA20-BH-HAW-10	11.66	GA20-BH10-009	SILTSTONE, grey with brown	7.5%
		11.86			Soaked
LMEL2020093078	GA20-BH-HAW-10	13.78	GA20-BH10-011	SILTSTONE, grey	6.6%
		14.00			Soaked
LMEL2020093080	GA20-BH-HAW-11	4.16	GA20-BH11-006	SILTSTONE, brown	10.0%
		4.27			Soaked
LMEL2020093081	GA20-BH-HAW-11	5.80	GA20-BH11-007	SILTSTONE, brown and grey	11.7%
		6.00			Soaked
LMEL2020093082	GA20-BH-HAW-11	6.65	GA20-BH11-008	SILTSTONE, brown and grey	20.6%
		6.84			Soaked
LMEL2020093084	GA20-BH-HAW-11	8.05	GA20-BH11-010	SILTSTONE, brown	9.6%
		8.16			Soaked
LMEL2020093085	GA20-BH-HAW-11	9.90	GA20-BH11-011	SILTSTONE, brown	12.9%
		10.00			Soaked
LMEL2020093086	GA20-BH-HAW-11	11.80	GA20-BH11-013	SILTSTONE, brown and grey	8.8%
		11.91			Soaked
LMEL2020093087	GA20-BH-HAW-11	13.59	GA20-BH11-015	SILTSTONE, brown and grey	7.2%
		13.70			Soaked
LMEL2020093089	GA20-BH-HAW-12	8.13	GA20-BH12-005	SILTSTONE, brown and grey	7.1%
		8.21			Soaked
LMEL2020093091	GA20-BH-HAW-12	10.28	GA20-BH12-007	SILTSTONE, brown and grey	6.9%
		10.39			Soaked
LMEL2020093092	GA20-BH-HAW-12	12.76	GA20-BH12-009	SILTSTONE, brown	8.5%
		12.90			Soaked
LMEL2020093093	GA20-BH-HAW-12	13.89	GA20-BH12-010	SILTSTONE, brown	9.1%
		13.95			Soaked

Definitions:

ND = Not determined

Specimen prepared by: AHS

Result reviewed by: AStevenson

Test performed by: NMD/LM

Date reported: **14/10/2020**

Cert. ref.: **20145767-003_TRM20-0614_RMC_20093072-20093093_Rep-20057554**

Approved signatory:

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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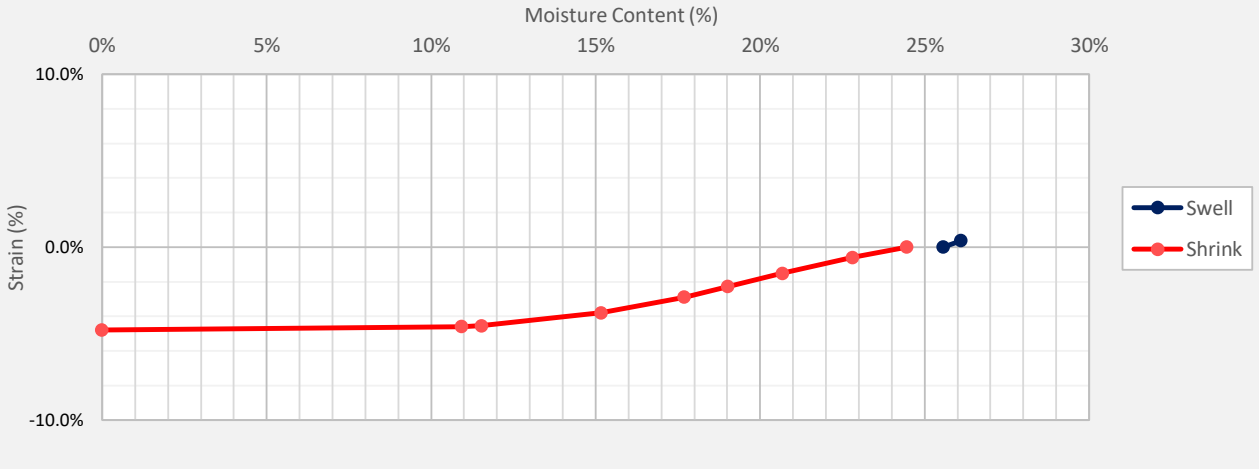
Soils testing - Determination of shrink-swell index (Soil reactivity tests)
Standard laboratory method for determining reactivity of soil
AS 1289.7.1.1-2003

GOLDER

Test request #:	TRM20-0615	**Lab sample ID:**	LMEL2020093096	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			**MELBOURNE GEOTECHNICAL LABORATORY**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	20145767-003	**Lab report ref.:**	LMEL_20057596		
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**Exploratory Hole**	GA20-BH-HAW-04	**Sample depth (m):**	1.50 - 1.90
				Client sample ref:	GA20-BH04-001
Location:	Hawthorn	**Project reference:**			
Specimen / lithological description:	(CI) CLAY, medium plasticity, brown and pale grey, trace fine to coarse grained sand			**Sample type:**	Undisturbed
				Sampled by:	Golder Engineer

Preparation of specimen and testing performed on samples supplied to the laboratory

Specimen swell		Specimen shrinkage		Specimen photo
Apparatus:	Swell Machine	**Apparatus:**	Shrink Mould	
Equipment ID:	GAMGL112.01.03	**Equipment ID:**	L35	
Date prepared:	6/10/2020	**Date prepared:**	6/10/2020	
Date Tested:	6/10/2020	**Date Tested:**	6/10/2020	
Initial Bulk density (t/m³):	ND	**Initial** Bulk density (t/m³):	2.01	
Initial Dry density (t/m³):	ND	**Initial** Dry density (t/m³):	1.62	
Initial moisure content:	25.6%	**Initial moisure content:**	24.5%	
Final moisure content:	26.1%			
Moisture content calculation is performed in accordance with AS AS 1289.2.1.1 - 2005		**Crumbling extent:**	None	
		Cracking extent:	Slight	



TEST RESULTS SUMMARY

Swell strain [ε_{sw}]: 0.4%	**Shrink strain [ε_{sh}]:** 4.8%	**Shrink swell index [I_{ss}]:** 2.8%

Inert material remarks: - -

Additional comments Specimen prepared from a u63 tube sample

Definitions:
ND = Not determined

Specimen prepared by: YHL
Result reviewed by: NLobb
Tests performed by: YHL
Date reported: 14/10/20

Cert. ref.: 20145767-003_GA20-BH-HAW-04_20093096_TRM20-0615_SSW_R20057596
Approved signatory:

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne
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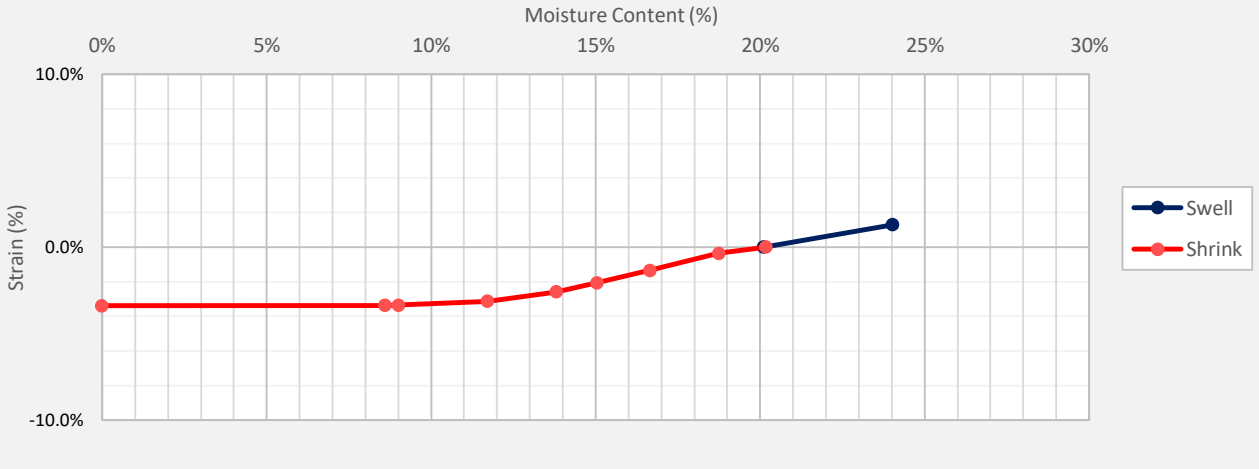
Soils testing - Determination of shrink-swell index (Soil reactivity tests)
Standard laboratory method for determining reactivity of soil
AS 1289.7.1.1-2003

GOLDER

Test request #:	**TRM20-0615**	**Lab sample ID:**	LMEL2020093099	**Golder Associates Pty Ltd**	
Client:	Hayball Pty Ltd			**MELBOURNE GEOTECHNICAL LABORATORY**	
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC			Building 7, Botanicca Corporate Park 570 - 588 Swan Street Richmond, Victoria 3121	
Project ID:	**20145767-003**	**Lab report ref.:**	LMEL_20057597		
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**Exploratory Hole**	**GA20-BH-HAW-07**	**Sample depth (m):**	1.50 - 1.90
				Client sample ref:	GA20-BH07-001
Location:	Hawthorn	**Project reference:**			
Specimen / lithological description:	(CI) CLAY, medium plasticity, brown with pale grey, trace fine to coarse grained sand			**Sample type:**	Undisturbed
				Sampled by:	Client

Preparation of specimen and testing performed on samples supplied to the laboratory

Specimen swell			**Specimen shrinkage**			**Specimen photo**
Apparatus:		**Swell Machine**	**Apparatus:**		**Shrink Mould**	
Equipment ID:		GAMGL112.01.02	**Equipment ID:**		L18	
Date prepared:		6/10/2020	**Date prepared:**		6/10/2020	
Date Tested:		6/10/2020	**Date Tested:**		6/10/2020	
Initial	**Bulk density (t/m³):**	ND	**Initial**	**Bulk density (t/m³):**	2.08	
	Dry density (t/m³):	ND		**Dry density (t/m³):**	1.73	
Initial moisure content:		20.1%	**Initial moisure content:**		20.2%	
Final moisure content:		24.0%				
Moisture content calculation is performed in accordance with AS AS 1289.2.1.1 - 2005			**Crumbling extent:**		None	
			Cracking extent:		Slight	



TEST RESULTS SUMMARY

Swell strain [ε_{sw}]:	**1.3%**	**Shrink strain [ε_{sh}]:**	**3.4%**	**Shrink swell index [I_{ss}]:**	**2.2%**

Inert material remarks: - -

Additional comments Specimen prepared from a u63 tube sample

Definitions:		**Specimen prepared by:**	YHL	**Tests performed by:**	YHL
ND = Not determined		**Result reviewed by:**	NLobb	**Date reported:**	14/10/20

Cert. ref.:	20145767-003_GA20-BH-HAW-07_20093099_TRM20-0615_SSW_R20057597	**Approved signatory:**
NATA	**NATA accreditation number: 1961 - Site:1250 - Melbourne**	
	Accredited for compliance with ISO/IEC 17025 - Testing	
	THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL [PAGE 1 OF 1]	**Nick Lobb - Senior Technician**

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Soil testing - Determination of permeability of a saturated specimen
Constant head method using a flexible wall permeameter
AS 1289.6.7.3-2016

GOLDER

Test request #:	**TRM20-0615**	**Lab sample ID:**	**LMEL20200930100**
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	**20145767-003**	**Project reference:**	
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**Exporatory Hole**	**GA20-BH-HAW-12**
Project reference:			
Specimen description:	(CL:ML) Sandy CLAY:SILT, low plasticity, grey and brown, fine to coarse grained sand		

Golder Associates Pty Ltd
MELBOURNE GEOTECHNICAL LABORATORY
Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Sample depth (m):	**4.00 - 4.40**
Client sample ref:	**GA20-BH12-002**
Location:	**Hawthorn**
Phase / Locale:	-
Sample type:	Undisturbed

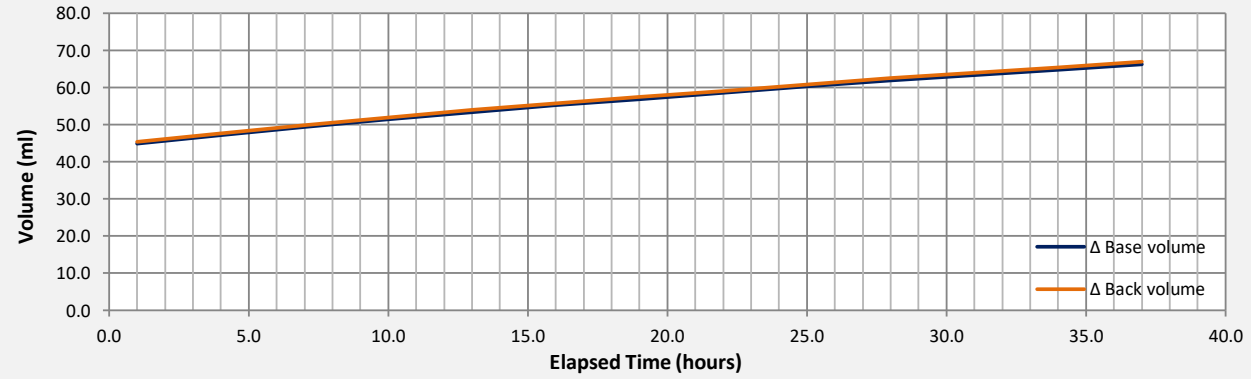
Specimen before testing	
Height [H] (mm)	63.3
Diameter [D] (mm)	63.3
[D]:[H]	1:1
Mass (g)	437.6
Moisture Content:	13.9%
Dry Density (t/m^3):	1.93
Assumed Porosity (%)	27.3%
Assumed Pore Volume (mL)	54.6

Compaction Details	
Method	-
Material retained on 19mm sieve (g):	-
Optimum Moisture Content:	-
Maximum Dry Density (t/m^3):	-
Target moisture content to OMC:	-
Target dry density relative to MDD:	-
Laboratory Moisture Ratio:	-
Laboratory Density Ratio:	-

Pre-test photo

Post-test photo

Permeability test details	
Permeant used:	Distilled water
Method of saturation:	Back pressure saturation
Estimate of initial saturation:	97.7%
Saturation B value:	98%
Confining Pressure (kPa):	1550
Inlet Pressure (kPa):	1510
Outlet Pressure (kPa):	1490
Mean effective stress (kPa):	50
Hydraulic Head (kPa):	20
Moisture content after test:	13.8%
Permeability: (m/s)	**2E-09**



Notes: Specimen prepared from a u63 tube sample, sampled by client

Definitions:	**Specimen Prepared by:**	LM	**Test Performed by:** LM
ND = Not Determined	**Results Reviewed by:**	NLobb	**Date Reported:** **14/10/20**

Cert. Ref.: **20145767-003_GA20-BH-HAW-12_200930100_TRM20-0615_PERM_R20057601**
Approved Signatory:

NATA

NATA accreditation number: 1961 - Site:1250 - Melbourne
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Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1 & AS 1726:2017 Section 6.1

GOLDER

Test request #:	**TRM20-0615**	**Lab sample ID:**	**LMEL20200930100**
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	**20145767-003**	**Lab report ref.:**	LMEL_20057585
Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**Exploratory Hole**	**GA20-BH-HAW-12**
Project reference:		**Loc. ref.:**	Hawthorn

Golder Associates Pty Ltd

MELBOURNE GEOTECHNICAL LABORATORY

Building 7, Botanicca Corporate Park

570 - 588 Swan Street

Richmond, Victoria 3121

Sample depth (m): 4.00 - 4.40

Client sample ref: GA20-BH12-002

Specimen description: (AS 1726:2017 Section 6.1)

Sampling: Tested as received

(CL:ML), Sandy CLAY:SILT, low plasticity, grey and brown, fine to coarse grained sand

Easting (m)	Northing (m)	Level (m)

PARTICLE SIZE DISTRIBUTION AS 1289.3.6.1

Sieve Size	Passing	LB S	UB S
125 mm	100%		
75 mm	100%		
63 mm	100%		
53 mm	100%		
37.5 mm	100%		
26.5 mm	100%		
19 mm	100%		
13.2 mm	100%		
9.5 mm	100%		
6.7 mm	100%		
4.75 mm	100%		
2.36 mm	100%		
1.18 mm	99%		
600 µm	96%		
425 µm	91%		
300 µm	84%		
212 µm	75%		
150 µm	68%		
75 µm	58%		

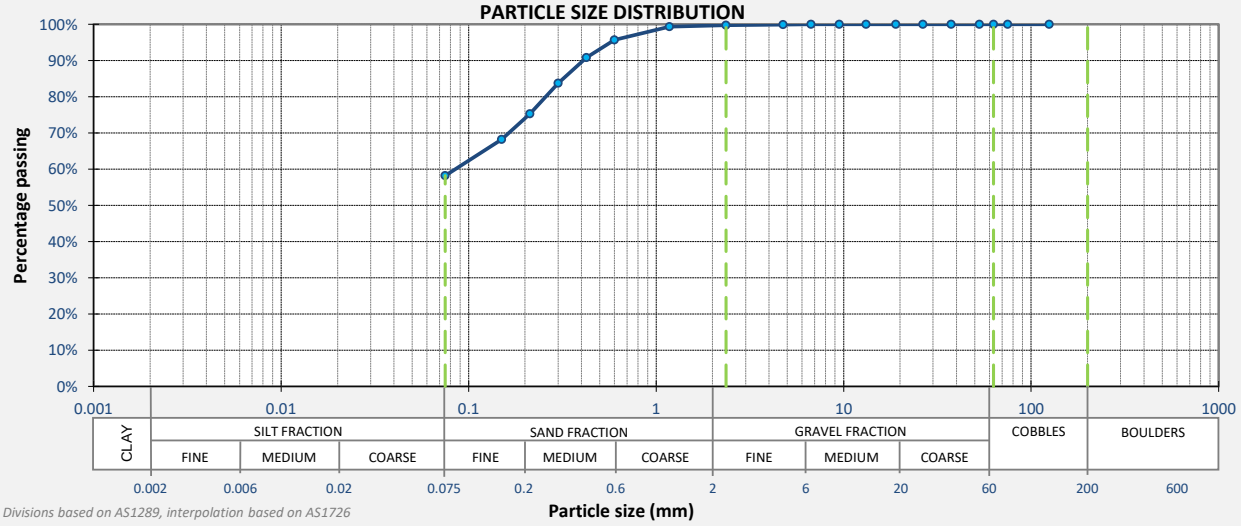
Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1	
	Moisture content	**1 point Liquid limit**	**Plastic limit**	**Plasticity index**	**Linear shrinkage**	**Curling/ Crumbling/ Cracking**
Result:	13.9% As Rcvd.	17%	13%	4%	2.5%	Cracking
LB S:						-
UB S:						-
Att. preparation method:		Dry sieved		**LSM length (mm):**		255
Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory					

Definitions:
LB S = Lower bound specification
UB S = Upper bound specification
LSM = Linear shrinkage mould
N/A = Not applicable
ND = Not determined; SIB = Slip in bowl
NO = Not obtainable; NP = Non plastic

GRADING SUMMARY

Fines	Sand*	Gravel*	Cobbles*
(<75 µm)	(>75 µm - <2.36 mm)	(>2.36 mm - <63 mm)	(>63mm - <200 mm)
58.2%	**41.6%**	**0.3%**	**0.0%**

**Proportions based on guidance in AS1726-2017 Section 6.1.4.2*



Divisions based on AS1289, interpolation based on AS1726

Testing by: NMD **Date:** 13/10/20 **Results reviewed by:** AStevenson **Date reported:** 14/10/2020

Cert. ref.: 20145767-003_GA20-BH-HAW-12_TRM20-0615_PSD_200930100_Rep20057585

Approved signatory:

NATA accreditation number: 1961 - Site:1250 - Melbourne

Accredited for compliance with ISO/IEC 17025 - Testing

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For issue

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These tests were carried out in accordance with the Australian standards identified in this certificate.
Test results relate only to the specimens tested.

Soils testing - Report of classification test results

Atterberg limits and linear shrinkage

Multiple AS test methods

GOLDER

Test request ID:	**TRM20-0615**	**Lab sample ID:**	20093095-20093099
Client:	Hayball Pty Ltd		
Client address:	Level 1, 250 Flinders Lane, Melbourne VIC		
Project ID:	**20145767-003**	**Lab report ref.:**	LMEL_20057584

Golder Associates Pty Ltd
MELBOURNE GEOTECHNICAL LABORATORY
Building 7, Botanicca Corporate Park
570 - 588 Swan Street
Richmond, Victoria 3121

Project name:	Public Housing Renewal Project 1-7 Bills Street, Hawthorn	**Location:**	Hawthorn
		Project reference:	

Soil description: (AS 1726:2017 Section 6.1) / Test procedure:				AS 1289.3.1.2-2009	AS 1289.3.2.1-2009	AS 1289.3.3.1-2009	AS 1289.3.4.1-2008	AS 1289.2.1.1-2005	AS 1141.12-2015
Lab sample ID	**Exploratory hole reference**	**Sample depth (m)**	**Specimen reference**	**Liquid limit 1pt.**	**Plastic limit**	**Plasticity index**	**Linear shrinkage**	**Moisture content**	**Finer than 75µm**
LMEL2020093095	GA20-BH-HAW-01	2.90 3.25	GA20-BH01-002	32%	14%	18%	7.5 % 250mm mould Cracking / Curling	13.8 % As rcvd.	-
(CL), CLAY, low plasticity, pale grey and orange brown						**Prep.:**	Dry sieved	**History:**	Oven dried
LMEL2020093096	GA20-BH-HAW-04	1.50 1.90	GA20-BH04-001	41%	15%	26%	11.5 % 250mm mould Curling	24.5 % As rcvd.	-
(CI), CLAY, medium plasticity, brown and pale grey, trace fine grained sand						**Prep.:**	Dry sieved	**History:**	Oven dried
LMEL2020093097	GA20-BH-HAW-05	2.50 2.95	GA20-BH05-002	52%	19%	33%	10.0 % 250mm mould Curling	18.2 % As rcvd.	-
(CH), CLAY, high plasticity, pale grey and pale orange, trace fine grained sand						**Prep.:**	Dry sieved	**History:**	Oven dried
LMEL2020093098	GA20-BH-HAW-06	1.50 1.95	GA20-BH06-001	55%	22%	33%	10.5 % 250mm mould Curling	23.1 % As rcvd.	-
(CH), CLAY, high plasticity, orange and pale grey, trace fine to coarse grained sand, trace fine gravel						**Prep.:**	Dry sieved	**History:**	Oven dried
LMEL2020093099	GA20-BH-HAW-07	1.50 1.90	GA20-BH07-001	50%	16%	34%	7.5 % 254mm mould Cracking / Curling	18.8 % As rcvd.	-
(CI), CLAY, medium plasticity, brown with pale grey, trace fine to coarse grained sand						**Prep.:**	Dry sieved	**History:**	Oven dried
						Prep.:		**History:**	
						Prep.:		**History:**	
						Prep.:		**History:**	
						Prep.:		**History:**	
						Prep.:		**History:**	

Definitions:

ND = Not determined

NO = Not obtainable

NP = Non plastic

SIB = Slipping in bowl

n/a = not applicable

Note: Specimens prepared from samples submitted to the laboratory.

Specimen prepared by:	YHL, NMD
Test performed by:	NMD
Date of testing:	**13/10/20**
Result reviewed by:	AStevenson
Date reported:	**14/10/2020**

Cert. ref.:	**20145767-003_TRM20-0615_ATT_20093095-20093099_Rep20057584**	**Approved signatory:**
NATA	**NATA accreditation number: 1961 - Site:1250 - Melbourne** Accredited for compliance with ISO/IEC 17025 - Testing	
	THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL	**Aaron Stevenson - Senior Technician**

APPENDIX E

Important Information

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Having regard to the matters referred to in the previous paragraphs on this page in particular, carrying out the Services has allowed Golder to form no more than an opinion as to the actual conditions at any relevant location. That opinion is necessarily constrained by the extent of the information collected by Golder or otherwise made available to Golder. Further, the passage of time may affect the accuracy, applicability or usefulness of the opinions, assessments or other information in this Report. This Report is based upon the information and other circumstances that existed and were known to Golder when the Services were performed and this Report was prepared. Golder has not considered the effect of any possible future developments including physical changes to any relevant location or changes to any laws or regulations relevant to such location.

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