



PRELIMINARY Geotechnical Investigation Report

McGregor Road Automotive Destination

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1 Introduction

This report presents the results of a preliminary geotechnical investigation performed by SMEC Australia Pty Ltd (SMEC) for the proposed McGregor Road Automotive Destination development in Pakenham, Victoria.

It is understood that the proposed development would comprise a multi-storey hotel with basement car park, hospitality / exhibition building, shooting club facilities, kart building, driver experience centre, private storage and other associated infrastructures. At the time of preparing this report, the proposed development is still at the master plan study phase.

This work has been commissioned by Podium One to undertake the preliminary geotechnical investigation under the SMEC Short-Form Consultancy agreement accepted and signed by Podium One dated 13 December 2019. The work has been performed in general accordance with SMEC proposal 1033018 Rev2, dated 12 December 2018.

The purpose of the geotechnical investigation presented herein is to assess subsurface conditions and to provide recommendations to assist with the conceptual design of the proposed development.

2 Scope of Works

The preliminary geotechnical investigation scope of works was developed by SMEC after considering the proposed development as stated in the Vision Plan Report dated November 2018 as stated below:

- Preparation of site-specific health, safety and environment plan for the geotechnical site investigation;
- Conduct a 'dial before you dig' search to assess the presence of buried services that could affect or may be at risk from the proposed works;
- Conduct underground service location checks with a suitably qualified contractor to ensure investigation locations do not impose within safety limits of underground services;
- Drill one 20m borehole, or prior refusal, at the location of the proposed hotel;
- Drill four 10m boreholes, or prior refusal, at the location of proposed low-level buildings and shooting range;
- Excavate six 2m test pits, or prior refusal;
- Install one standpipe piezometer within a select borehole to accurately measure groundwater levels;
- Undertake sampling for geotechnical laboratory testing; and,
- Complete a geotechnical report which includes factual data in conjunction with interpretive comments and recommendations pertaining to the geotechnical aspect of the proposed development.

3 Desktop Study

3.1 General

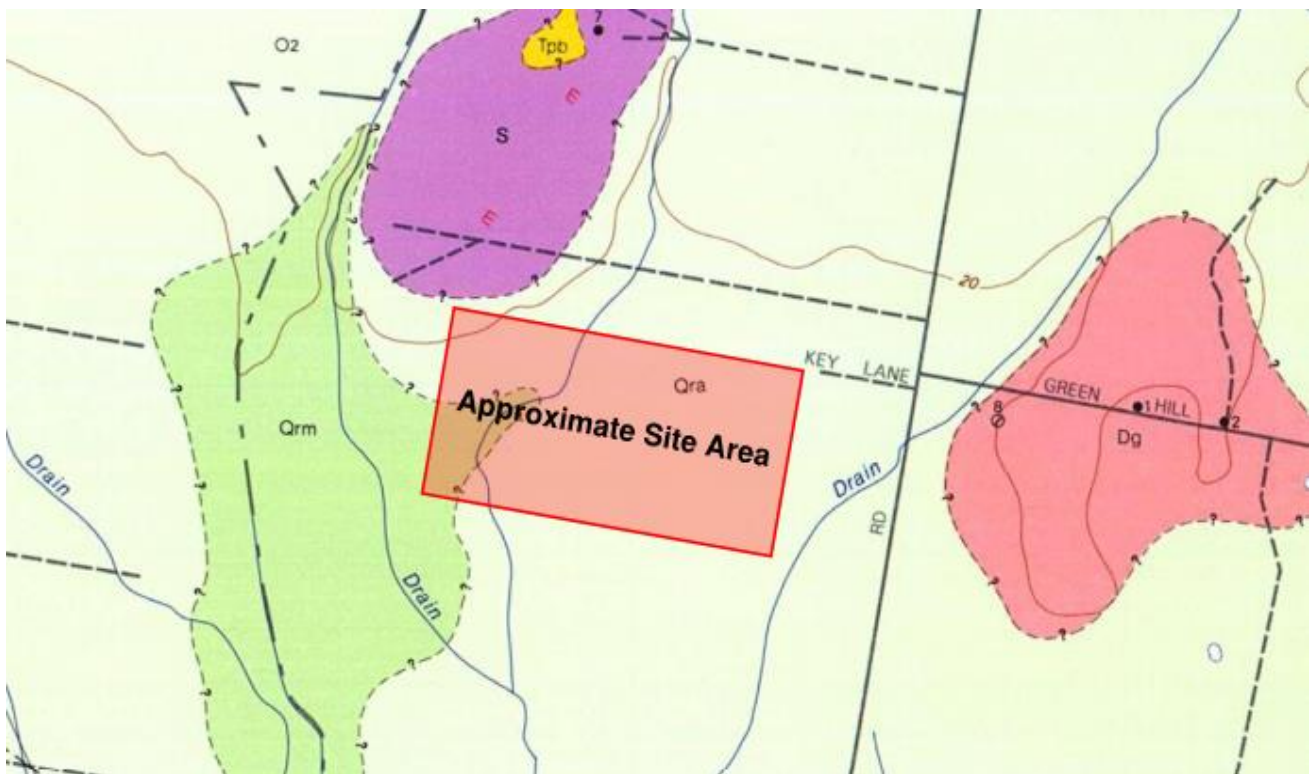
The subject site is located off McGregor Road, Pakenham and about 60km South-East of Melbourne in Victoria. The project site is bounded by Keys Lane (an unsealed road) to the north, McGregor Road to the east and a HV transmission line to the south. The site is generally covered by grasses, shrubs and trees. A locality plan is presented in Figure 1.



Figure 1: Approximate Site Location (Reference: QGIS dated 30 May 2019)

3.2 Anticipated Geological Setting

Reference to the Geological Survey of Victoria 1:25,000 scale 'Pakenham' map indicates that a majority of the site is underlain by Quaternary aged alluvial-colluvial deposits (Qra) that consists of sands, silts and clays. The geological map indicates that the far western side of site is expected to be underlain by Quaternary aged lacustrine deposits (Qrm) that consists of clays, sandy clays and silts. An extract of the geological map is shown in Figure 2.



Qrm Recent Quaternary Aged Lacustrine Deposits: Clays, Sandy Clays and Silts

Qra Recent Quaternary Aged Alluvial/Colluvial Deposits: Sands, Silts and Clays

Figure 2: Extract of Geological Survey of Victoria 1:25,000 scale 'Pakenham' map

3.3 Published Borehole Data

The Visualising Victoria's Groundwater (VVG) interactive map presents one borehole located within 500 m of the site area. This borehole indicates the top soil is 0.25 m thick and it is underlain by grey clay to a depth of 2 m BGL (metres below ground level) overlying hard sandy clays to a depth of 25 m BGL. Below this, residual granite recovered as sands and clays were found to a depth of 32 m BGL.

3.4 Published Groundwater Data

The VVG interactive map shows that the water table within the site may be encountered within the upper 5 m BGL and the groundwater salinity is expected to be in the range of 3,500-7,000 mg/l.

4 Investigation Methodology

4.1 Fieldwork

A site walkover was carried out on 8th January 2019 by a SMEC geotechnical engineer. This was then followed by test pit excavations on 17th January and borehole drilling between 23rd and 25th January 2019.

A suitably qualified underground service locator was engaged during the site walkover to ensure test locations would not impact any services that may be located within the site area. The fieldworks involved the excavation of six (6) test pits to a target depth of 2 m, the drilling of four (4) boreholes to a target depth of 10 m and one (1) borehole to a target depth of 20 m. All investigation locations were within vacant lands previously used as farmland and dirt-track motorcycle circuits.

The test pits were excavated using a 5-tonne excavator sourced by Southern Plant Hire. Bulk samples were collected from recovered spoil for laboratory testing and pocket penetrometer readings were undertaken on the side walls of the test pits to a maximum depth of 1.5 m.

The boreholes were drilled using a 4WD mounted drill rig, supplied and operated by Apex Drilling Pty Ltd. The boreholes were advanced using solid flight auguring and wash boring techniques. Standard Penetration Tests (SPTs) were collected at nominal 1.5 m depth intervals in soil strata. The SPTs were conducted to assess soil consistencies and to collect disturbed samples at select depths. Thin-walled tubes (U50) were used to collect undisturbed soil samples at nominated depths to target cohesive materials within select boreholes.

DCP tests were conducted at all borehole and test pit locations to a maximum depth of 1.5 m.

The borehole co-ordinates and surface RL's are summarised in Table 4-1. The coordinates of the boreholes were recorded using a hand-held GPS device and elevations were taken from the site survey provided by Podium 1 in an email dated 21st January 2019 and are accurate to the nearest 0.2 m. A site locality plan and a borehole location plan are presented in Appendix A.

The selected samples were sent for laboratory testing to assist in determining the engineering properties of site soils. The laboratory tests were undertaken in a NATA accredited laboratory.

Borehole engineering logs together with explanatory notes describing terms and symbols used in their preparation are provided in Appendix B. Long sections presenting the inferred geological cross-section of site are provided in Appendix C.

Fieldwork was supervised by a SMEC Geotechnical Engineer who was responsible for positioning the boreholes and test pits at the nominated locations, preparing borehole/test pit logs in general accordance with AS1726-2017 'Geotechnical Site Investigations' and coordinating soil sampling. On completion, all boreholes and test pits aside from BH05 were backfilled with excavated/drilled spoil and reinstated to match the existing ground surface. The excavator bucket was used to compact the backfill within each test pit.

A standpipe piezometer was installed in BH05 to a depth of 14 m. Upon completion, the standpipe was developed by bailing 3 times the well volume.

The standpipe construction is discussed further in Section 5.3 with the construction details shown in Appendix B.

Table 4-1: Summary of borehole and test pit locations (UTM 55H coordinate system)

Investigation ID	Easting (m)	Northing (m)	Final Depth (m BGL)	Approximate Elevation* (m AHD)
BH01	364311	5782089	10.45	15.6
BH02	364259	5781590	9.95	13.2
BH03	364554	5781982	10.45	15.2
BH04	365132	5781966	9.95	16.2
BH05	365008	5781914	19.60	15.6
TP01	364358	5781967	2.00	14.8
TP02	364417	5781584	2.00	13.6
TP03	364725	5782023	2.00	15.8
TP04	365050	5781784	2.00	15.0
TP05	364849	5781594	2.00	13.4
TP06	365162	5781470	2.00	13.8

* Elevation levels are taken from survey data provided by Podium 1

4.2 Geotechnical Laboratory Testing

Laboratory testing on selected soil samples was undertaken in a NATA registered Laboratory. The laboratory testing was undertaken in accordance with the relevant sections of AS1289 *“Methods of Testing Soils for Engineering Purposes”*. The laboratory testing completed include:

- 3 x Atterberg limits and linear shrinkage tests;
- 3 x Field moisture content tests;
- 3 x Particle size distribution tests (AS1289 3.6.1);
- 1 x pH, Chloride, Sulphate and Sulphide
- 2 x Standard Compaction tests
- 2 x Californian Bearing Ratio (CBR) tests
- 1 x Shrink Swell test

The laboratory test result certificates are presented in Appendix D.

5 Fieldwork Results

5.1 Site Walkover

Observations from the site walkover found that the site was split roughly down the centre along a north-south orientation by a creek line. The east side of the creek line consisted of farmland paddocks with low-lying, green grasses. The grass was maintained at relatively short lengths due to grazing from cattle that were kept within the paddocks. The surface was relatively flat with some scattered dams located regularly across site and sparse trees residing along some sections of paddock boundaries. Figure 3 presents site photographs showing the typical surface to the east of the creekline.



Figure 3: Site photographs of the typical surface profile to the east of the creekline (left) and a dry dam located on site (right)

The west side of the creek line and the surrounding surface of the creekline itself was covered with thick, tall reeds, dry wheat crops, and large bushes. This area of site was once used as a motorcycle course with heavily undulating bumps and berms across the surface. A majority of the surface was observed to be natural with the exception of built-up earth mounds on some corners of the old motorcycle track. Figure 4 presents site photographs showing the typical surface along and to the west of the creekline.



Figure 4: Site photographs of the creekline (left) and typical surface profile to the west of the creekline (right)

A residential dwelling was observed on the north-eastern side of site, just off Key Lane, and some small sheds with abandoned vehicles resided in two areas along the southern side of site where the old motorcycle clubs were located.

5.2 Subsurface Conditions

This section provides a general description of the subsurface conditions encountered across the site. For conditions encountered at specific borehole/test pit locations, reference should be made to the engineering borehole/test pit logs provided in Appendix B. The sub-surface conditions encountered in the boreholes were generally consistent with those anticipated from published geological sources. Summary tables of the encountered subsurface conditions are presented in Table 5-2.

5.3 Groundwater

The groundwater at BH05 was recorded from the development of a standpipe at this location. The standpipe in borehole BH05 was built from a combination of solid and slotted, high-pressure PVC pipe. The slotted section was installed at a depth from 8 m to 14 m and the remainder of the standpipe was constructed with solid PVC. The top of the PVC was sealed with a standpipe cap and was installed as a monument with a 750 mm stick-up from the ground surface (as shown in Figure 5) to prevent surface run-off from entering the standpipe and for ease of location.

Groundwater level measurements observed during the preliminary geotechnical investigation are summarised in Table 5-1.

Table 5-1: Groundwater Level Measurements

Groundwater RL (m BGL)					
Borehole ID	BH01	BH02	BH03	BH04	BH05
Groundwater Depth Below Ground Level observed during drilling (m BGL)	3.5*	3.5*	7.5*	9.5*	-
Groundwater Depth Below Ground Level observed in the standpipe (m BGL)	-	-	-	-	9

Notes:

m BGL – metres Below Ground Level

* Groundwater levels were measured during drilling. Further groundwater checks are recommended to determine groundwater levels following establishing the groundwater equilibrium state.



Figure 5: Site Photograph of Standpipe Monument

It should be noted that all boreholes and test pits aside from BH05 were not opened long enough and did not have appropriate casing support to establish accurate groundwater readings. However, approximate groundwater levels were recorded on all borehole logs that was inferred from observations made on the recovered samples.

5.4 Laboratory Test Results

Geotechnical laboratory test results of soils are summarised in Table 5-3. Aggressivity testing (pH, Sulphate, Chloride, and electrical conductivity) are summarised in Table 5-4. Laboratory certificates are presented in Appendix D.

Table 5-2: Summary of Encountered Subsurface Conditions (TP01 to TP06 and BH01 to BH05)

Ground Condition	Depth to Top of Strata (m BGL)										
	TP01	TP02	TP03	TP04	TP05	TP06	BH01	BH02	BH03	BH04	BH05
Top Soil – Silty CLAY, low plasticity, with rootlets	0	0	0	0	0	0	0	0	0	0	0
Alluvial Deposits - Silty CLAY – medium to high plasticity, stiff to very stiff, dark grey to grey, trace sand, trace rootlets,	0.12	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1	0.1
Alluvial Deposits - Silty CLAY / Sandy CLAY / Clayey SILT – high plasticity, generally firm to stiff, grey, mottled brown, dark grey, red and white, medium to coarse grained sand	1.4	1.5	-	-	-	1.5	0.1 ^B	0.5*	0.5 ^A	1.0	1.0
Alluvial Deposits – Clayey SAND / Silty SAND / SAND– medium dense to dense, fine to coarse grained sand, grey, mottled brown and red	-	-	-	-	-	-	8	-	9	9.5	12.5
Residual Soil – Silty CLAY / Gravelly CLAY, hard, brown, mottled grey, fine grained angular gravel, residual soils of Silurian aged siltstone	-	-	-	-	-	-	-	-	-	-	13.5
TP/BH Terminated Depth	2	2	2	2	2	2	10.45	9.95	10.45	9.95	19.6

Notes:

m BGL – metres Below Ground Level TP – Test Pit,

BH – Borehole

^A Hard Sandy Clay from 8 to 9m^B Hard Sandy Clay from 7 to 8m

Table 5-3: Summary of Geotechnical Laboratory results

Borehole ID	Depth	Field Moisture Content	Standard Maximum Dry Density	CBR	CBR Swell	Liquid Limit	Plastic Limit	Plasticity Index	Linear Shrinkage	Particle Size Passing 0.075mm	Shrink Swell (Iss)
	(m BGL)	(%)	(t/m ³)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
BH02	3.5 – 3.95	10.5	-	-	-	36	13	23	9	23	-
BH03	10 – 10.45	7	-	-	-	19	13	6	2.5	45	-
BH04	2.5 – 2.86	-	-	-	-	-	-	-	-	-	2.3
BH05	1 - 1.4	-	-	-	-	-	-	-	-	-	1.2
TP01	0.4 – 0.5	-	1.89	3.5	0.5	-	-	-	-	-	-
TP06	0.3 – 0.5	9	1.86	1.5	2.0	34	13	21	11	63	-

Table 5-4: Summary of Laboratory Aggressivity Results

Borehole ID	Depth	Field Moisture Content	pH	Chloride	Sulphate (So ⁴)	Electrical Conductivity (EC)
	(m BGL)	(%)	(pH units)	(mg/kg)	(mg/kg)	(μS/cm)
BH02	0.6 – 0.7	11	6.9	30	37	86
BH05	6.2 – 6.3	19	7.9	490	81	320

6 Comments

6.1 Interpretive Ground Model

A summary of the generalised geotechnical ground model is presented in Table 6-1 and an inferred geological section is presented in Appendix C. Soft to firm silty clays were recovered within BH02 which is near the expected transition from alluvium to lacustrine deposits and where groundwater infiltration from the nearby creekline is evident.

All boreholes and test pits reached their target depths aside from BH05 which refused at a depth of 19.6m on hard residual soils.

Delineation of material types, formations and soil consistencies were the primary factors when forming the ground models. Soil consistencies were determined based on visual tactile assessments on site with a particular focus on in-situ tests such as Dynamic Cone Penetration, Pocket Penetrometer and Standard Penetration Tests.

Table 6-1: Interpreted Ground Model of Majority of Site

Unit No.	Material Description	Depth of Unit (m BGL)
1	Topsoil Silty Clay with rootlets	0 to 0.1
2a	Alluvial Soil Silty/Sandy CLAY – medium to high plasticity, dark grey to grey, trace sand, trace rootlets, stiff to very stiff consistency	0.1 to 1
2b	Alluvial Soil Silty CLAY / Sandy CLAY / Clayey SILT – high plasticity, generally firm to stiff, grey, mottled brown, dark grey, red and white, medium to coarse grained sand	1 to 9
2c	Alluvial Soil Clayey SAND / Silty SAND / SAND – moderately dense to dense, fine to coarse grained sand, grey, mottled brown and red	9 to 13.5
3	Residual Soil Silty CLAY / Gravelly CLAY, hard, brown, mottled grey, fine grained angular gravel, residual soils of Silurian aged siltstone	13.5 to 19.6 ^R

Notes: ^R Refusal on residual soil

6.2 Design Parameters

The preliminary geotechnical design parameters are presented in Table 6-2 and are appropriate for conceptual designs. At the detailed design phase a more detailed investigation across the site would be necessary to refine these parameters. These values have been determined based on the site conditions at the time of the investigation and some of them may change if the soil is subject to prolonged rainfall or soaking during construction.

The preliminary lateral design parameters are given in Table 6-2. Consideration of the car park basement design and construction should be considered in the detailed geotechnical investigation phase.

Table 6-2: Geotechnical Preliminary Design Parameters

Unit	Material	Unit Weight ¹	Conservative SPT N-Value	Undrained Shear Strength (S _u)	Poisson's Ratio	Young's Modulus (E _s)	Effective Cohesion, C'	Effective Friction, Φ'	'At-rest' Pressure Co-eff.	Active Earth Pressure Co-eff.	Passive Earth Pressure Co-eff.
		(kN/m ³)		(kPa)		(MPa)	(kPa)	(°)	K _o	K _a	K _p
1	Topsoil	-	-	-	-	-	-	-	-	-	-
2a	Alluvial Soil Silty/Sandy CLAY (stiff to very stiff)	19	-	75-125	0.25-0.3	35-65	5-10	25-30	0.50-0.58	0.33-0.40	2.5-3.0
2b	Alluvial Soil Silty CLAY/Sandy CLAY/Clayey SILT (firm to stiff)	18	7	30-75	0.25-0.3	15-40	3-8	22-27	0.55-0.63	0.38-0.45	2.2-2.6
2c	Alluvial Soil Clayey SAND / Silty SAND / SAND (moderately dense to dense)	18	22	-	0.2-0.25	10-15	0-5	28-35	0.43-0.53	0.27-0.36	2.8-3.8
3	Residual Soil Silty CLAY / Gravelly CLAY (hard)	20	47	200-300	0.25-0.3	60-90	8-12	28-35	0.43-0.53	0.27-0.36	2.8-3.8

6.3 Suitable Foundation Options

Based on the supplied information, it is understood that the proposed development will comprise some 2-3 storey above ground buildings with no basements and an 8 storey above ground hotel building with basements.

Given that no layout plans and cross sections of the buildings are available, it is assumed that some of the buildings may be founded on shallow foundations.

Shallow foundations would be considered appropriate for lightly loaded buildings within major portion of the site where alluvial deposits are present, except in the south-western corner of site where weaker soils were observed. For heavily loaded structures, utilising pile foundations may be more cost effective.

For preliminary geotechnical assessment, it is considered a total settlement of 25mm is tolerable for lightly loaded (100kPa) footings founded in Unit 2a. The total settlement would be refined once the structural dimensions and loading for the footing is provided and after completion of the detailed geotechnical investigation.

As the design loads are expected to be greater than a residential type dwelling for the proposed low-level buildings, typical slab on ground stiffened raft footing design in accordance with AS2870-2011 for residential foundation may not be feasible without sufficient engineering input to limit long term settlement and other ground behaviour.

6.4 Temporary and Permanent Slope Angles

For dry batters cut into the alluvial firm to very stiff clays, the slope angles in Table 6-3 are recommended for short and long-term conditions. The batter angles presented assume surcharge loads are kept clear of batter crests and surface water is diverted away from batters. The minimum investigation groundwater level of 3.5m bgl was assumed for all analyses. These calculations were completed in the program SlopeW using the interpreted ground model summarised in Table 6-1 with parameters taken from Table 6-2.

Table 6-3: Recommended Batter Angles with Adopted Geotechnical Parameters

Material*	Undrained Shear Strength (kPa)	Drained Cohesion (kPa)	Effective Friction Angle (°)	Unit Weight (kN/m)	Batter Height (m bgl)	Temporary Condition (H:V)	Long Term Condition (H:V)
Unit 2a	100	8	25	19	< 1	0.5 : 1	1 : 1
Unit 2a	100	8	25	19	1 - 2	1 : 1	1.5 : 1
Unit 2b	50	5	22	18			
Unit 2a	100	8	25	19	2 - 3	1 : 1	2.5 : 1
Unit 2b	50	5	22	18			

* Unit 2a expected to a depth of 1m underlain by Unit 2b

Temporary Condition – Excavations left open for short periods of time only during the construction phase <3 months

Long Term Condition – Excavations left open indefinitely

Batter angles of excavations must be witnessed, verified and best assessed by an experienced geotechnical engineer during works. Flatter batter angles may be required if adverse ground and weather conditions are encountered / anticipated.

6.5 Subgrade CBR Value

The limited number of laboratory CBR testing undertaken indicates CBR values of Unit 2A vary between 1.5% and 3.5% and the CBR swell percentages ranges from 0.5% to 2.0%.

For preliminary designs SMEC recommends a design CBR value of 2.0% for clay subgrade soils may be adopted. Site specific CBR testing to confirm the assumed design values is recommended for any critical or highly trafficked sections of pavement. Consideration could be given for subgrade treatments for the clay subgrade materials to allow more economical pavement design. Site clays must be treated as expansive.

It should be noted that there may be fill placement over areas of site (particularly in the bike track regions). In the areas of fill, the CBR values will be dependent on the source, quality, and compaction of the fill material.

6.6 Site Trafficability

The site was trafficable for a 5 tonne excavator and a four-wheel drive vehicle during the time of the investigation (January 2019).

Due to the thick vegetation observed on the western side of the creekline, it would be ideal to perform vegetation removal prior to construction works to allow full access to the site. Only one safe access over the creekline was observed during the geotechnical site visit and is situated on the south side of site near the old motorcycle race track. Access to surrounding farmland paddocks or construction of bridges over the creekline may be required if more access is required between the eastern and western side of site.

Problems may arise from disturbance of the upper level soil fabric resulting from the removal of the existing vegetation. This may limit trafficability for light weight construction vehicles and create difficulties for earthworks operations during wet season. It is recommended that vegetation be trimmed (mowed) and shrubs be cut to the ground level, which will preserve the crust and improve trafficability. Whereas clearing and grubbing would present issues if the crust is breached, and this would be more pronounced after rainfall events.

Should the upper soils become saturated during construction, the removal of the topsoil layer and placement of a temporary working platform (consisting of a geotextile placed under rock fill) may be required to allow access for light weight construction plant and road vehicles.

It is recommended that the following steps be taken to improve trafficability:

- The exposed surface in the construction area is proof rolled to provide a seal and assist in identifying weak or soft areas for treatment;
- Dedicated construction tracks are used to control site traffic and limit trafficability issues; and
- Provision and maintenance of adequate drainage conditions at this site is essential. It should be ensured that runoff is diverted away from the construction and access tracks to prevent ponding of water.

To assist in maintaining a workable construction site, the placement of a working platform as a final layer across structure/building platforms is recommended. The potential trafficability problems with this site should not be underestimated. This site will very quickly become untrafficable if appropriate drainage control measures, along with construction practices appropriate for the site conditions, are not maintained.

The contractor performing the works should fully inform themselves of the ground conditions at the site prior to commencement of earthworks. This requirement should be explicit in any earthworks specifications or contract. Allowance should be made for the design, construction, and maintenance of a suitable working platform to support construction plant and heavy equipment such as piling rigs. Further advice can be provided by SMEC once details pertaining to design levels and construction plant are available.

6.7 2-3 Level Buildings with no basement levels

At the assumed building level, the foundation material is expected to typically comprise firm to stiff clays. The suitability of spread footings to support the proposed building will depend on the applied loading & predicted long term settlement and whether the resulting footings are of a reasonable size to be feasible.

Internal columns supported on pad footings should be assessed on a case by case basis based on the subsoil encountered. In stiff to very stiff clayey soils an allowable bearing pressures of 100 - 200 kPa may be adopted.

6.8 8 Level Hotel Building

Owing to the firm to stiff clayey soils, options to support the hotel building on shallow foundation should be carefully investigated and engineered based on the loading conditions. At this stage details of the likely loading are not known, a deep foundation system may be appropriate for the 8-storey hotel building in these ground conditions.

6.9 Subgrade Preparation for Access Roads

If the subgrade can be successfully proof rolled (in accordance with Section 173 of VicRoads Standard Specifications for Roadworks and Bridgeworks) without excessive movement, there will be no need to improve the subgrade for construction purposes. Any soft spots encountered during subgrade preparation which do not respond to further compaction should be removed and replaced with suitable material compacted to the necessary moisture and density ratio requirements.

Onsite soils are prone to softening when wet. If excessively wet and soft soil are encountered at the time of construction and the subgrade cannot be successfully proof rolled, a working platform will be required to facilitate compaction of the overlying layers. The working platform may comprise lime stabilisation of insitu soil, placement of imported select fill or placement of durable granular material. The use of a geotextile and geogrid beneath/within a granular working platform will assist in reducing the required thickness of the platform.

6.10 Excavatability

As stated in Section 6.1, it is expected that the natural excavation material will comprise soils across the entire site and rock is unlikely to be recovered at shallow depths. Conventional excavation machinery is assumed to be suitable for construction works on this site and excavatability is unlikely to be an issue.

6.11 Anticipated Construction Difficulties

Large trees and thistles were identified onsite during the site walkover. Removal of this vegetation and their associated roots will be required as part of the subgrade preparation, since roots can be deleterious to foundations. Care should be taken when removing the roots, as incomplete removal could lead to under-draining and ground settlement when the roots decompose.

It is important to note the various dams scattered across site that may contribute to excessive increases in moisture conditions within the surrounding soil, particularly during winter months, and may present trafficability/excavatability issues during construction works.

6.12 Construction Inspections

It is recommended that if any construction activities are undertaken based on the information provided, construction inspection of the footings / pile excavations be undertaken by a SMEC geotechnical engineer to confirm that the ground conditions are consistent with those anticipated.

7 Conclusion

From the findings of the site investigations, factual information and recommended geotechnical parameters for preliminary design are provided in this report.

Depending on the final development plans for the site, should any design changes occur during the next development phase then further targeted investigations may be required to confirm ground conditions across the site.

Additional geotechnical investigations may be required after preliminary design stage of the development to delineate subsurface conditions if affected for pile foundation.

8 Limitation

This report has been prepared by SMEC, on behalf of Podium One for the McGregor Road Automotive Destination project. This report has been prepared in accordance with the Services Contract between SMEC and Podium One. This report is prepared exclusively for Podium One for this project only. This report should not be used for other purposes and by any third party.

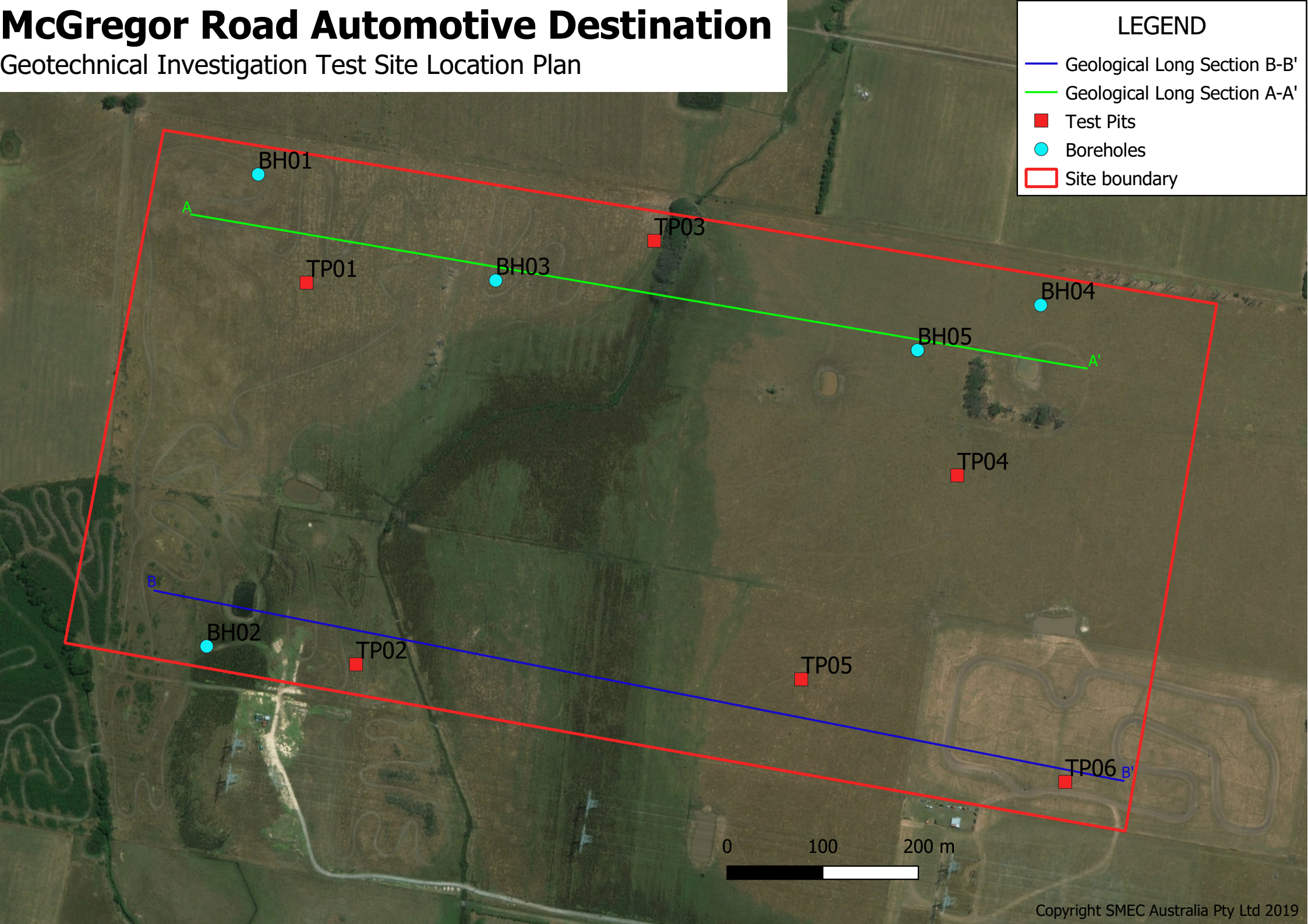
This report has been prepared based on data available to SMEC at the time of preparing this report. The sub-surface conditions provided in this report are indicative only and are based on available sub-surface testing records (i.e. borehole, standard penetration tests). The sub-surface testings were undertaken at the specific location on specific time and only to the depths investigated. The accuracy of advice and sub-surface conditions provided in this report may be different from the actual sub-surface conditions due to the variable geological processes and undetected sub-surface conditions between the test points.

This report should be used as an entirety and the sections of this report should not be used separately. SMEC cannot be held responsible for any interpretations, decisions and conclusions made by others based on the contents provided in this report. SMEC endeavoured to identify the risks associated with the design and construction. SMEC cannot be held responsible for any risks associated with design and constructions. There may be risks associated with the design and constructions that are not documented or discussed in this report due to the unforeseen site conditions, variation of sub-surface conditions or beyond the knowledge of SMEC designers. However, should there be any risks arise during the design and/or construction SMEC would be endeavoured to carry out a risk assessment of the potential hazards, if requested.

Appendix A Test Site Location Plan

McGregor Road Automotive Destination

Geotechnical Investigation Test Site Location Plan



Appendix B Borehole/Test Pit Logs and Explanatory Notes

Explanatory Notes of Abbreviations and Terms

Used on Borehole and Excavation Logs

General

Information obtained from site investigations is recorded on log sheets. The “Engineering Log – Borehole or Non Cored Borehole” presents data from drilling operations where a core barrel has not been used to recover material, and information is based on a combination of regular sampling and in-situ testing. The material penetrated in non-core drilling is commonly soil but may include rock. The “Engineering Log – Cored Borehole” presents data from drilling operations where a core barrel has been used to recover material – commonly rock. The “Engineering Log - Excavation” presents data obtained on the subsurface profile from observations of excavations, either natural or man-made. It may contain a scaled, graphical presentation of the typical excavation profile. Refusal of the excavation plant is noted should it occur.

As far as is practicable, the data contained on the log sheets is factual. Some interpretation is inevitable in the assessment of material boundaries in areas of partial sampling, the location of areas of core loss, description and classification of material, estimation of strength and identification of drilling induced fractures. Material description and classification is generally based on AS1726-2017.

Drilling Method

Code	Description
ADT	Auger drilling with TC-bit
ADV	Auger drilling V-bit
AS	Auger screwing
AT	Air track
CA	Casing advancer
CC	Concrete core
CTR	Cable tool rig
DB	Wash bore drag bit
HA	Hand auger
HAND	Hand methods
HF	Hollow flight auger
HMLC	Diamond core 62mm diameter
HQ	Wire line core barrel 64mm diameter
HQ3	Wire line core barrel 62mm diameter
NDD	Non destructive drilling
NMLC	Diamond core 52mm diameter
NQ	Wire line core barrel 47mm diameter
NQ3	Wire line core barrel 45mm diameter
PT	Continuous push tube
PQ	Wire line core barrel 85mm diameter
RAB	Rotary air blast
RC	Reverse circulation
RD	Rotary blade or drag bit
RR	Rock roller
RT	Rotary tricone bit
SD	Sonic drilling
TBX	Tube-X
VC	Vibro-core drilling
WB	Wash bore drilling

Drilling Penetration

Ease of penetration in non-core drilling

VE	Very easy
E	Easy
F	Firm
H	Hard
VH	Very hard

Support and Casing

Code	Description	Code	Description
C	Casing	Hw	114.3 mm
M	Mud	NW	88.9 mm
W	Water	PVC	150 mm

Core Run

Core lifts are identified by a line and depth with core loss per run as a percentage. Core loss is shown in the core run unless otherwise indicated.

Defect Spacing

The average distance between defects is measured parallel to the core axis in mm and may be expressed as a range or average.

Angle / Orientation

Angle from horizontal and orientation to magnetic north.

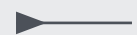
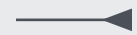


For inclined cored boreholes the Alpha and Beta angles are presented for orientated core. Alpha (α) is measured relative to the core axis, whilst Beta (β) is measured clockwise from the reference line looking down the core axis in the direction of drilling.

Excavation Method

N	Natural exposure
X	Existing excavation
BB	Tractor mounted backhoe bucket
EX	Hydraulic excavator
EH	Hydraulic excavator with hammer
B	Bulldozer blade
R	Ripper

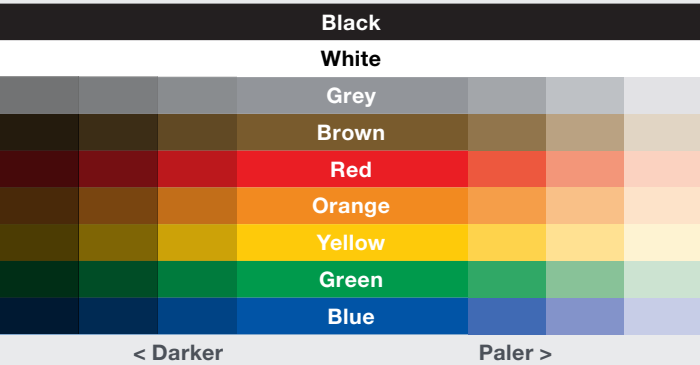
Water / Drilling Fluid

The drilling fluid used is identified and loss of return to the surface is estimated as a percentage, generally of each core lift.

Symbol	Description
	Water inflow
	Water outflow
	Water level: during drilling or immediately after completion of drilling
	Groundwater level with date observed prior to introduction of fluids or after standpipe construction
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.
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.

Colour

The colour of a soil or rock is described in a moist/wet condition using simple terms, such as black, white, grey, red, brown, orange, yellow green or blue. These are modified as necessary by 'pale', 'dark' or 'mottled'. Borderline colours are described as a combination of these colours (e.g. orange-brown). Where a soil or rock consists of a primary colour with a secondary mottling it is described as (primary colour) mottled (first colour) and (secondary colour).



Description of Soil

- i. Soil name (BLOCK LETTERS)
- ii. Plasticity or particle size of soil
- iii. Colour
- iv. Secondary soil components names & estimated proportions, including their plasticity / particle characteristics, colour
- v. Minor soil components name, estimated proportions, including their plasticity / particle characteristics, colour
- vi. Other minor soil components
- vii. Moisture condition
- viii. Consistency / density
- ix. Structure of soil, geological origin
- x. Additional observations

Particle Size

Term		Grain Size
Clay		< 2 μm
Silt		2 – 75 μm
Sand	Fine	0.075 – 0.21 mm
	Medium	0.21 – 0.6 mm
	Coarse	0.6 – 2.36 mm
Gravel	Fine	2.36 – 6.7 mm
	Medium	6.7 – 19 mm
	Coarse	19 – 63 mm
Cobbles		63 – 200 mm
Boulders		> 200 mm

Fine Grained and Coarse Grained Soils

Term	Description
Fine Grained Soil (cohesive)	More than 35% of the material less than 63 mm is smaller than 0.075 mm (silts and clays)
Coarse Grained Soil	More than 65% of the material less than 63 mm is larger than 0.075 mm (sands, gravels and cobbles)

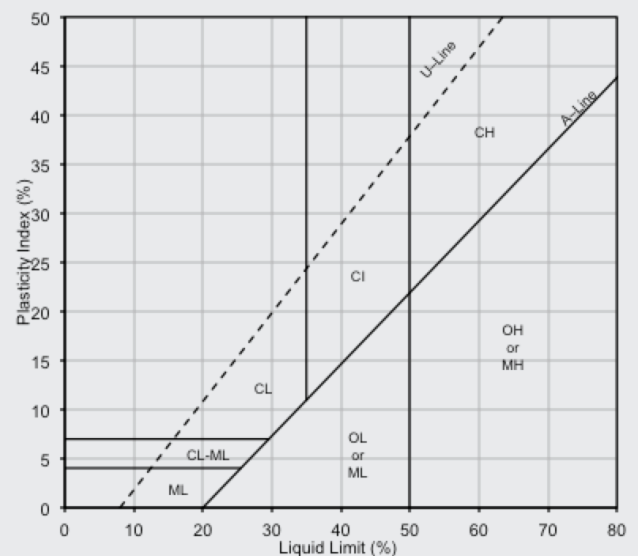
Descriptive Terms for Secondary and Minor Components

Designation of Components	In coarse grained soils				In fine grained soils	
	% Fines	Terminology	% Accessory coarse fraction	Terminology	% Sand / Gravel	Terminology
Minor	≤5	trace	≤15	trace	≤15	trace
	>5, ≤12	with	>15, ≤30	with	>15, ≤30	with
Secondary	>12	prefix	>30	prefix	>30	prefix

Plasticity – Fine Grained Soils

Liquid Limit (LL) %	Description
≤ 35	Low plasticity (L)
>35 to ≤ 50	Medium plasticity (I)
> 50	High plasticity (H)

Plasticity Chart– Fine Grained Soils



Consistency Terms – Fine Grained Soils

Term	Undrained shear strength (kPa)	Indicative SPT (N) Blow Count	Field Guide to Consistency
Very Soft (VS)	<12	0 – 2	Easily penetrated several centimetres by fist, exudes between fingers when squeezed in fist
Soft (S)	12 – 25	2 – 4	Easily penetrated several centimetres by thumb, easily moulded by light finger pressure
Firm (F)	25 – 50	4 – 8	Can be penetrated several centimetres by thumb with moderate effort, and moulded between the fingers by strong pressure
Stiff (St)	50 – 100	8 – 15	Readily indented by thumb but penetrated only with difficulty. Cannot be moulded by fingers
Very Stiff (VSt)	100 – 200	15 – 30	Readily indented by thumb nail, still very tough
Hard (H)	>200	>30	Indented with difficulty by thumb nail, brittle
Friable (Fr)	-		Can be easily crumbled or broken into small pieces





Density Terms – Coarse Grained Soils

Term	Density Index (%)	SPT (N) Blow Count
Very Loose (VL)	< 15	0 – 4
Loose (L)	15 – 35	4 – 10
Medium Dense (MD)	35 – 65	10 – 30
Dense (D)	65 – 85	30 – 50
Very Dense (VD)	> 85	>50

Particle Characteristics – Coarse Grained Soils

Term	Description
Well Graded	Having good representation of all particle sizes
Poorly graded	With one or more intermediate size poorly represented
Gap graded	With one or more intermediate sizes absent
Uniform	Essentially of one size

Angularity – Coarse Grained Soils

	Rounded
	Sub-rounded
	Angular
	Sub-angular

Origin of Soil

Fill	Formed by humans
Aeolian	Formed by wind
Alluvial	Formed by streams and rivers
Colluvial	Formed on slopes (talus)
Estuarine	Formed in marine environments
Lacustrine	Formed in lakes
Residual	Formed by weathering insitu




















Soil Moisture

	Term	Code	Description
Coarse Grained	Dry	D	Looks and feels dry and free running
	Moist	M	Soil feels cool, darkened in colour, soils tend to stick together, soil grains do not run freely through fingers and no visible free water
	Wet	W	Soil feels cool, darkened in colour, soils tend to stick together, free water on remoulding
Fine Grained	Moist, Less than Plastic Limit	W < PL	Hard and friable or powdery, moisture content well below Plastic Limit
	Moist, Near Plastic Limit	W ≈ PL	Soil feels cool, darkened in colour, can be moulded, near Plastic Limit
	Moist, Wet of Plastic Limit	W > PL	Soil feels cool, dark, usually weakened, free water, moisture content well above Plastic Limit
	Wet, Near Liquid Limit	W ≈ LL	Soil exudes easily
	Wet, Wet of Liquid Limit	W > LL	Soil behaves as a liquid

Boundary Classifications

Soils possessing characteristics of two groups are designated by combinations of group symbols. For example, GW-GC, well graded gravel-sand mixture with clay binder.

Graphic Symbols

	Asphalt		MH
	CH		ML
	CI		OH
	CL		OL
	Concrete		PT
	Fill		SC
	GC		SM
	GM		SP
	GP		SW
	GW		

Soil Classification

Soils are described in general accordance with AS1726-2017 as shown below.

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 63 mm and basing fractions on estimated mass)					GROUP SYMBOL	PRIMARY NAME	
COARSE GRAINED SOILS More than 65% of the material is less than 63 mm and is larger than 0.075 mm	A particle size of 0.075 is about the smallest size distinguishable to the naked eye	GRAVELS More than half of coarse fraction is larger than 2.36 mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines	GW	GRAVEL	
				Predominantly one size or a range of sizes with more intermediate sizes missing, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines	GP	GRAVEL	
			GRAVELS w/ FINES (Appreciable amount of fines)	'Dirty' materials with excess of non-plastic fines, none to medium dry strength; ≥ 12% silty fines	GM	SILTY GRAVEL	
				'Dirty' materials with excess of plastic fines, medium to high dry strength; ≥ 12% clayey fines	GC	CLAYEY GRAVEL	
		SANDS More than half of coarse fraction is smaller than 2.36 mm	CLEAN SANDS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines	SW	SAND	
				Predominantly one size or a range of sizes with more intermediate sizes missing, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines	SP	SAND	
			SANDS w/ FINES (Appreciable amount of fines)	'Dirty' materials with excess of non-plastic fines, none to medium dry strength; ≥ 12% silty fines	SM	SILTY SAND	
				'Dirty' materials with excess of plastic fines, medium to high dry strength; ≥ 12% clayey fines	SC	CLAYEY SAND	
		FINE GRAINED SOILS More than 35% of the material less than 63 mm is less than 0.075 mm	IDENTIFICATION PROCEDURES ON FRACTIONS < 0.075 mm				
			SILTS AND CLAYS Liquid Limit < 50%	DRY STRENGTH	DILATANCY	TOUGHNESS	GROUP SYMBOL
None to low	Slow to rapid			Low	ML	SILT	
Medium to high	≥ 12% clayey fines			Medium	CL, CI	CLAY	
SILTS AND CLAYS Liquid Limit > 50%	Low to medium		Slow	Low	OL	ORGANIC SILT	
	Low to medium		None to slow	Low to medium	MH	SILT	
	High to very high		None	High	CH	CLAY	
	Medium to high		None to very slow	Low to medium	OH	ORGANIC CLAY	
HIGHLY ORGANIC SOILS: readily identified by colour, odour, spongy feel and frequently fibrous texture					PT	PEAT	

Description of Rock

- i. Rock name (BLOCK LETTERS)
- ii. Grain size and mineralogy
- iii. Colour
- iv. Fabric and texture
- v. Features, inclusions, minor components, moisture content and durability
- vi. Strength
- vii. Weathering and/or alteration
- viii. Rock mass properties – discontinuities and structure of rock
- ix. Interpreted stratigraphic unit
- x. Additional observations including geological structure

Simple rock names are used to provide a reasonable engineering description, rather than a precise geological classification. The rock name is chosen by considering the nature and shape of the grains or crystals, the texture and fabric of the rock material, the geological structure and setting, and information from the geological map of the area. Further guidance on the naming of rocks can be found in AS1726-2017, Tables 15, 16, 17 and 18. Typical rock types are described below, though subject to site specific variations.

Rock Type	Description	Example of Rock Name
Sedimentary	Formed by deposited beds of sediments, have grains that are cemented together and often rounded. Significant porosity	<p>COMMON: Conglomerate, Breccia, Sandstone, Mudstone, Siltstone, Claystone</p> <p>≥90% CARBONATE: Limestone, Dolomite, Calcirudite, Calcarenite, Calcisiltite, Calcilutite</p> <p>PYROCLASTIC: Agglomerate, Volcanic Breccia, Tuff</p>
Igneous	Formed from molten rock and have a crystalline texture. Typically massive and low porosity. Rock types are from coarse to fine grained.	<p>HIGH QUARTZ CONTENT: Granite, Microgranite, Rhyolite</p> <p>MODERATE QUARTZ CONTENT: Diorite, Microdiorite, Andesite</p> <p>LOW QUARTZ CONTENT: Gabbro, Dolerite, Basalt</p>
Metamorphic	Formed when rocks are subject to heat and/or pressure and have typically have directional fabric. Typically have low porosity and crystalline structure. Rock types are from coarse to fine grained	<p>FOLIATED: Gneiss, Schist, Phyllite, Slate</p> <p>NON-FOLIATED: Marble, Quartzite, Serpentine, Hornfels</p>
Duricrust	Formed as part of a weathering profile and show evidence of being cemented in situ. Cementation is typically irregular and exhibits replacement textures.	<p>Ferricrete (Iron oxides and hydroxides)</p> <p>Silicrete (Silica)</p> <p>Calcrete (Calcium carbonate)</p> <p>Gypcrete (Gypsum)</p>

Note: () denotes dominant cementing mineralogy

Grain Size

Terms describing dominate grain size in sedimentary rocks.

Term	Grain size
Coarse	Mainly 0.6 mm to 2 mm
Medium	Mainly 0.2 mm to 0.6 mm
Fine	Mainly 0.06mm (just visible) to 0.2 mm

Terms describing dominate grain size in igneous and metamorphic rocks

Term	Grain size
Coarse	Mainly greater than 2 mm
Medium	0.06 mm to 2 mm
Fine	Mainly less than 0.06 mm (just visible) to 0.2mm

Texture and Fabric

Sedimentary rocks

Thickness	Bedding Term
< 6 mm	Thinly laminated
6 – 20 mm	Laminated
20 – 60 mm	Very thinly bedded
60 – 200 mm	Thinly bedded
0.2 – 0.6 m	Medium bedding
0.6 – 2 m	Thickly bedded
> 2 m	Very thickly bedded

Igneous rocks

Term	Definition
Amorphous	Indicates that the rock has no obvious crystalline structure
Crystalline	A regular molecular structure, showing crystal structure and symmetry.
Cryptocrystalline	The texture comprises crystals that are too small to recognise under an ordinary microscope. Indistinctly crystalline.
Porphyritic	Indicates the presence of phenocrysts (relatively large crystals in a fine grained ground mass) in igneous rocks.
Flow banded	Indicates visible flow lines in volcanic rocks and some intrusive rocks
Glassy	Entirely glass like. No crystalline units and without crystalline structure.
Vesicular	A texture of volcanic rocks that indicates the presence of vesicles (small gas bubbles). Where the vesicles are filled with a mineral substance they are termed Amygdales and the texture is Amygdaloidal.

Metamorphic

Term	Definition
Foliation	The parallel arrangement of minerals due to metamorphic process, which shall be defined by the terms in weak, moderate and strongly foliated.
Porphyroblastic	A texture indicating the presence of porphyroblasts (larger crystals formed by recrystallization during metamorphism, such as garnet or staurolite in a mica schist).
Cleavage	A type of foliation developed in fine grained metamorphic rocks such as slates.

Bedding and Fabric Development

Type	Definition
Massive	No obvious development of bedding – rock appears homogeneous
Poorly Developed	Bedding is barely obvious as faint mineralogical layering or grain size banding, but bedding planes are poorly defined.
Well Developed	Bedding is apparent in outcrops or drill core as distinct layers or lines marked by mineralogical or grain size layering.
Very Well Developed	Bedding is often marked by a distinct colour banding as well as by mineralogical or grain size layering.
Indistinct fabric	There is little effect on strength properties
Distinct Fabric	The rock may break more easily parallel to the fabric

Rock Strength

Term (Code)	UCS (MPa)	Is ₍₅₀₎ (MPa)	Field Guide to Strength
Very Low (VL)	0.6 – 2	> 0.03 to ≤ 0.1	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 3 cm thick can be broken by finger pressure.
Low (L)	2 - 6	> 0.1 to ≤ 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blow of the pick point; has dull sound under hammer. A piece of core 150 mm long 50 mm in diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium (M)	6 - 20	> 0.3 to ≤ 1.0	Readily scored with a knife; a piece of core 150 mm long by 50 mm in diameter can be broken by hand with difficulty.
High (H)	20 - 60	> 1 to ≤ 3	A piece of core 150 mm long by 50 mm in diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High (VH)	60 - 200	> 3 to ≤ 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High (EH)	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Rock strength is assessed by laboratory Uniaxial Compressive Strength (UCS) testing and/or Point Load Strength Index (PLT) testing to obtain the Is₍₅₀₎ the strength table implies a 20 times correlation between Is₍₅₀₎ and UCS used for classification. Note however, multiplier may range from 4 (e.g. some carbonated and low strength rocks) to 40 (e.g. some igneous rocks and/or some high strength rocks). A site specific correlation based on testing, previous investigation or literature may be used where available. These terms refer to the strength of the rock material and not to the strength of the rock mass which may be considered weaker due to the effect of rock defects.

Visual Log

A diagrammatic plot of defects showing type, spacing and orientation in relation to the core axis.

————	Defects open in situ or clay sealed
-----	Defects closed in-situ
.....	Drill induced fractures or handling breaks
■	Infilled seam

Rock Weathering and or Alteration Classification

Term (Code)		Definition	
Residual soil (RS)		Soil developed on extremely weathered rock. The rock mass structure and substance fabric are no longer evident but the soil has not been significantly transported.	
Extremely weathered (EW) Extremely altered (XA)		Rock is weathered to such an extent that it has 'soil' properties, i.e, it either disintegrates or can be remoulded in water, but the texture of original rock is still evident.	
Highly weathered (HW) Highly Altered (HA)	Distinctly weathered (DW)* Distinctly Altered (DA)	Whole rock material is discoloured usually by extent that iron staining or bleaching and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original rock substance is no longer recognisable	*Where is it not practical to distinguish between 'HW' and MW'. Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores
Moderately weathered (MW) Moderately Altered (MA)		Whole rock material is discoloured usually by staining that original colour of the fresh rock is no longer recognisable	
Slightly weathered (SW) Slightly altered (SA)		Rock is slightly discoloured but shows little or no change of strength from fresh rock	
Fresh rock (F)		Rock shows no sign of decomposition or staining.	

Rock Core Recovery

TCR = Total Core Recovery (%)

$$\frac{\text{Length of Core Recovered}}{\text{Length of Core run}} \times 100$$

SCR = Solid Core Recovery (%)

$$\frac{\text{Sum Length of Cylindrical Core Recovered}}{\text{Length of Core run}} \times 100$$

RQD = Rock Quality Designation (%)

$$\frac{\text{Sum Length of Sound Core Pieces > 100mm in length}}{\text{Length of Core run}} \times 100$$

Types of Discontinuities

Term	Code	Description
Parting	Pt	A defect parallel or sub-parallel to a layered arrangement of mineral grains or micro-fractures, which has caused planar anisotropy in the rock substance.
Joint	Jt	A defect across which the rock substance has little tensile strength, but that is not related to textural or depositional features within the rock substance.
Sheared Zone	SZ	A zone with roughly parallel planar boundaries of rock substance consisting of closely spaced joints with smooth slickensided surfaces often curved. The joints divide the rock mass into unit blocks usually of lenticular or wedge shape.
Crushed Zone	CZ	A zone or seam with roughly parallel planar boundaries of rock substance composed of disoriented, usually angular, fragments of the host rock substance
Seam	Se	A zone or seam with roughly parallel boundaries, infilled by soil (IS) or decomposed rock (DS)
Fault	F	A fracture (defect) in rock along which there has been an observable amount of displacement.
Vein	Ve	A zone of minerals intruded into a joint or fissures.

Type of Structures

Term	Code	Description
Bedding	Bg	A layered arrangement of minerals parallel to the surface of deposition which has caused planar anisotropy in the rock substance.
Cleavage	C	An alignment of fine grained minerals caused by deformation.
Schistosity	SH	A layered arrangement of minerals to each other
Foliation	Fo	A planar alignment of minerals caused by deformation.
Void	Vo	A completely empty space
Dyke	DK	Sheet-like bodies of igneous rock that cut across sedimentary bedding or foliations in rocks. They may be single or multiple in nature
Sill	SI	A sill is an intrusion of magma that spreads underground between the layers of another kind of rock
Contact	Cn	A contact between intrusive and stratigraphic units.
Boundary	Bd	A distinct boundary between two stratigraphic units

Note: Drill breaks (DB) and handling breaks (HB) are not included as natural discontinuity.

Discontinuity Spacing

Spacing (mm)	Description
>6000	Extremely Widely Spaced
2000 - 6000	Very Widely Spaced
600 - 2000	Widely Spaced
200 - 600	Medium Spaced
60 - 200	Closely Spaced
20 - 60	Very Closely Spaced
<20	Extremely Closely Spaced

Discontinuity Planarity

Code	Description
Cu	Curved – A defect with a gradual change in orientation
Ir	Irregular – A defect with many sharp changes in orientation
Pl	Planar – Defect forms a continuous plane without variation in orientation
St	Stepped – A defect with distinct sharp steps or step
Un	Undulose – A defect with undulations
Vu	Vuggy – An open void with crystallisation
Wv	Wavy – A wavy defect surface

Discontinuity Roughness

Abbreviation	Description
Ro	Rough – Many small surface irregularities generally related to the grain size of the parent rock
Sm	Smooth – Few or no surface irregularities related to the grain size of the parent rock
Po	Polished – Planes have a distinct sheen or a smoothness
Sl	Slickensided – Planes have a polished, grooved or striated surface consistent with differential movement of the parent rocks along the plane
VR	Very rough – many large surface irregularities, amplitude generally more than 1mm

Infill Material

Code	Name	Code	Name
Ca	Calcite	Gp	Gypsum
Ch	Chlorite	Mn	Manganese
Cl	Clay	MS	Secondary mineral
Co	Coal	Py	Pyrite
Fe	Limonite / Ironstone	Um	Unidentified mineral
Fe Cl	Iron oxide clay	Qz	Quartz
Fl	Feldspar	X	Carbonaceous

Discontinuity Observation

Term	Code	Description
Clean	CN	No visible coating or infill
Stain	SN	No visible coating or infill but surfaces are discoloured by mineral staining
Veneer <1 mm	VNR	A visible coating or soil or mineral substance but usually unable to be measured. If discontinuous over the plane, patchy veneer.
Coating >1 mm to <10 mm	CT	A visible coating or infilling of soil or mineral substance. Describe composition and thickness.
Filling (Filled) >10 mm	FLD	A visible filling of soil or mineral substance. Describe composition and thickness.

Samples and Field Tests

Code	Description
B	Bulk disturbed sample
BLK	Block sample
C	Core sample
DS	Small disturbed sample
ES	Soil sample for environmental testing
EW	Water sample for environmental testing
FP	Pressuremeter
G	Gas sample
H	Hydraulic fracturing
HP	Hand penetrometer test
I	Impression device
IS ₍₅₀₎	Point Load Index
K	Permeability
LB	Large bulk disturbed sample
N	Standard penetration test result (N* denotes SPT sample recovery)
O	Core orientation
P	Piston sample
PID	Photoionisation detector reading in ppm
R	Hammer bouncing / refusal
SPT	Standard Penetration Test
U	Undisturbed push in sample
UCS	Uniaxial Compressive Strength
U50	Undisturbed tube sample (50 mm diameter)
U75	Undisturbed tube sample (75 mm diameter)
VS	Vane shear test
● (A)	Axial Test
○ (D)	Diametral Test
□	Irregular Lump test

Completion Details

Type	Description
Collapse	Exploratory hole collapsed before reaching planned depth
Equipment Failure	Boring or excavator equipment operational failure
Flooding	Flooding of excavation
Machine Limit	Limit of machine capability reached
Obstruction	Obstruction preventing further advancement
Possible services	Indication of possible services below
Services present	Services encountered during exploratory hole
Squeezing	Hole squeezing boring equipment
Target Depth	Depth reached as planned
Target Depth Instrumentation Installed	Depth reached as planned instrumentation installed
Target Depth Standpipe Installed	Depth reached as planned open standpipe constructed
Material Refusal	Material preventing further advancement

Laboratory Tests

Code	Description
ACM	Asbestos Containing Material
CD	Consolidated Drained
CU	Consolidated Undrained
LL	Liquid Limit
LS	Linear Shrinkage
MC	Moisture Content
MDD	Maximum Dry Density
OMC	Optimum Moisture Content
PBT	Plate Bearing Test
PI	Plasticity Index
PL	Plastic Limit
PSD	Particle Size Distribution
ρ_b	Bulk Density
ρ_p	Particle Density
ρ_d	Dry Density
UU	Undrained Unconsolidated

Backfill / Standpipe Detail

Symbol	Description	Symbol	Description
	Cement seal		Filter pack: sand filter
	Grout backfill		Filter pack: gravel filter
	Blank pipe		Bentonite seal
	Slotted pipe		Cutting – excavated material backfill
	Surface Completion: Monument Above Ground		Surface Completion: Gatic Ground Monument



Member of the Surbana Jurong Group

HOLE NO : BH01
PROJECT NUMBER : 30041864
SHEET : 1 OF 2
FINAL DEPTH : 10.45 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT: McGregor Road Automotive Destination

PROJECT NUMBER : 30041864
SHEET : 1 OF 2
FINAL DEPTH : 10.45 m

POSITION : E: 364311.0, N: 5782089.0 (MGA94 Zone 55)

SURFACE ELEVATION : 15.60 (m AHD)

INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig

MOUNTING : track

CONTRACTOR : Apex

HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC

CHECKED BY : ZW

[illegible]

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

SMEC AUSTRALIA



log SMEC NON CORE LOG WITH DCP MCGREGOR RD AUTOMOTIVE DESTINATION GINT.GPJ | Lib: SEMC 1.06.5 lib Pj: SMEC 1.06.0

NON-CORE DRILL HOLE - ENGINEERING LOG

HOLE NO : BH01
PROJECT NUMBER : 30041864
SHEET : 2 OF 2
FINAL DEPTH : 10.45 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

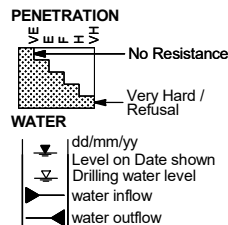
POSITION : E: 364311.0, N: 5782089.0 (MGA94 Zone 55) SURFACE ELEVATION : 15.60 (m AHD) INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig MOUNTING : track CONTRACTOR : Apex HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC CHECKED BY : ZW

DRILLING						MATERIAL							
PROGRESS		VE F. PENETRATION VH	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm	STRUCTURE & Other Observations
DRILLING & CASING	DRILLING FLUID												
AS <													

METHOD
HA Hand auger
AS Auger screwing
ADV Auger drilling with V bit
ADT Auger drilling with TC bit
HF Hollow flight auger
WB Wash-bore drilling
RR Rock roller
SD Sonic drilling
NDD Non destructive drilling
PT Continuous push tub
HAND Hand methods



SAMPLES & FIELD TESTS
B Bulk Disturbed Sample
D Disturbed Sample
U Undisturbed Sample
ES Environmental Sample
W Water Sample
HP Hand Penetration Test
SPT Standard Penetration Test
N Result of SPT (*=sample taken)
R Hammer Bouncing / Refusal
U50 Undisturbed Sample (50mm dia)
U75 Undisturbed Sample (75mm dia)
VS Vane Shear; peak/remoulded(kPa)
PT Push Tube
MC Moisture Content

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D Dry
M Moist
W Wet
PL Plastic limit
LL Liquid limit

CONSISTENCY/ RELATIVE DENSITY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

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

SMEC AUSTRALIA



NON-CORE DRILL HOLE - ENGINEERING LOG

HOLE NO : BH02
PROJECT NUMBER : 30041864
SHEET : 1 OF 2
FINAL DEPTH : 9.95 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 364259.0, N: 5781590.0 (MGA94 Zone 55) SURFACE ELEVATION : 13.20 (m AHD) INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig MOUNTING : track CONTRACTOR : Apex HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC CHECKED BY : ZW

DRILLING						MATERIAL								
PROGRESS		VE F PENETRATION VH	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm	STRUCTURE & Other Observations
DRILLING & CASING FLUID	DRILLING FLUID								SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components	ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components				
ADV					13.0	0.0		CL	0.10m	Silty CLAY: low plasticity, dark grey	D	Fr		TOPSOIL
										Silty CLAY: high plasticity, dark grey, trace sand		VSt		ALLUVIUM
					0.50m									
					SPT 1 2,3,2 N=5									
					0.95m					becoming dark grey, mottled brown				0.60: Environmental sample taken at 0.6m-0.7m
					2.00m									1.60: HP samp =100 kPa
					SPT 2 1,1,2 N=3									1.80: HP samp =80 kPa
					2.45m									
						11.0	2.0		CH			M		
					10.0	3.0			3.00m	Clayey SAND: fine to coarse grained, dark grey, low to medium plasticity clay	W			
					9.0	4.0		SC						
					8.0	5.0			5.00m	Silty CLAY: high plasticity, grey, mottled brown, trace fine grained, sub-angular gravel	M			
					5.45m			CH				VSt		5.70: HP samp =200 kPa
					6.00m	6.0								

METHOD HA Hand auger AS Auger screwing ADV Auger drilling with V bit ADT Auger drilling with TC bit HF Hollow flight auger WB Wash-bore drilling RR Rock roller SD Sonic drilling NDD Non destructive drilling PT Continuous push tub HAND Hand methods	PENETRATION WATER dd/mm/yy Level on Date shown Drilling water level water inflow water outflow	SAMPLES & FIELD TESTS B Bulk Disturbed Sample D Disturbed Sample U Undisturbed Sample ES Environmental Sample W Water Sample HP Hand Penetrometer (kPa) SPT Standard Penetration Test N Result of SPT (*=sample taken) R Hammer Bouncing / Refusal U50 Undisturbed Sample (50mm dia) U75 Undisturbed Sample (75mm dia) VS Vane Shear; peak/remoulded(kPa) PT Push Tube MC Moisture Content	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet PL Plastic limit LL Liquid limit	CONSISTENCY/ RELATIVE DENSITY VS - Very Soft S - Soft F - Firm VSt - Stiff VSt - Very Stiff H - Hard Fb - Friable VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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METHOD
HA Hand auger
AS Auger screwing
ADV Auger drilling with V bit
ADT Auger drilling with TC bit
HF Hollow flight auger
WB Wash-bore drilling
RR Rock roller
SD Sonic drilling
NDD Non destructive drilling
PT Continuous push tub
HAND Hand methods

PENETRATION
No Resistance
Very Hard / Refusal
dd/mm/yy
Level on Date shown
Drilling water level
water inflow
water outflow

SAMPLES & FIELD TESTS
B Bulk Disturbed Sample
D Disturbed Sample
U Undisturbed Sample
ES Environmental Sample
W Water Sample
HP Hand Penetration Test
SPT Standard Penetration Test
N Result of SPT (*=sample taken)
R Hammer Bouncing / Refusal
U50 Undisturbed Sample (50mm dia)
U75 Undisturbed Sample (75mm dia)
VS Vane Shear; peak/remoulded(kPa)
PT Push Tube
MC Moisture Content

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D Dry
M Moist
W Wet
PL Plastic limit
LL Liquid limit

CONSISTENCY/ RELATIVE DENSITY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
Vst - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

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

SMEC AUSTRALIA



NON-CORE DRILL HOLE - ENGINEERING LOG

HOLE NO : BH02
PROJECT NUMBER : 30041864
SHEET : 2 OF 2
FINAL DEPTH : 9.95 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 364259.0, N: 5781590.0 (MGA94 Zone 55) SURFACE ELEVATION : 13.20 (m AHD) INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig MOUNTING : track CONTRACTOR : Apex HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC CHECKED BY : ZW

DRILLING							MATERIAL														
PROGRESS		VE FH	F PENETRATION VE FH	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm					STRUCTURE & Other Observations			
DRILLING & CASING FLUID	DRILLING FLUID												0	5	10	15	20				
ADV ↓					DS-1	6.0				Silty CLAY: high plasticity, grey, mottled brown, trace fine grained, sub-angular gravel (<i>continued</i>)	M	VSt						ALLUVIUM			
					6.50m SPT 5 3.8,11 N=19	7.0														6.30: HP samp =250 kPa	
					6.95m																
						8.0															
					8.00m SPT 6 5.6,7 N=13	8.0															
					8.45m																
						9.0															
					9.50m SPT 7 6.8,12 N=20	9.0														9.00: HP samp =300 kPa	
					9.95m																
						9.95m															
						10.0				Hole Terminated at 9.95 m Target Depth											
						11.0															
						12.0															

METHOD
HA Hand auger
AS Auger screwing
ADV Auger drilling with V bit
ADT Auger drilling with TC bit
HF Hollow flight auger
WB Wash-bore drilling
RR Rock roller
SD Sonic drilling
NDD Non destructive drilling
PT Continuous push tub
HAND Hand methods

PENETRATION
No Resistance
Very Hard / Refusal
WATER
dd/mm/yy
Level on Date shown
Drilling water level
water inflow
water outflow

SAMPLES & FIELD TESTS
B Bulk Disturbed Sample
D Disturbed Sample
U Undisturbed Sample
ES Environmental Sample
W Water Sample
HP Hand Penetration Test
SPT Standard Penetration Test
N Result of SPT (*=sample taken)
R Hammer Bouncing / Refusal
U50 Undisturbed Sample (50mm dia)
U75 Undisturbed Sample (75mm dia)
VS Vane Shear; peak/remoulded(kPa)
PT Push Tube
MC Moisture Content

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System
MOISTURE
D Dry
M Moist
W Wet
PL Plastic limit
LL Liquid limit

CONSISTENCY/ RELATIVE DENSITY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

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

SMEC AUSTRALIA



HOLE NO : BH03

PROJECT NUMBER : 30041864

SHEET : 1 OF 2

FINAL DEPTH : 10.45 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT: McGregor Road Automotive Destination

POSITION : E: 364554.0, N: 5781982.0 (MGA94 Zone 55)

SURFACE ELEVATION : 15.20 (m AHD)

INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig

MOUNTING : track

CONTRACTOR : Apex

HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC

CHECKED BY : ZW

[illegible]

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

SMEC AUSTRALIA



NON-CORE DRILL HOLE - ENGINEERING LOG

HOLE NO : BH03
PROJECT NUMBER : 30041864
SHEET : 2 OF 2
FINAL DEPTH : 10.45 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 364554.0, N: 5781982.0 (MGA94 Zone 55) SURFACE ELEVATION : 15.20 (m AHD) INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig MOUNTING : track CONTRACTOR : Apex HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC CHECKED BY : ZW

DRILLING							MATERIAL										
PROGRESS		VE F. PENETRATION VH	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm					STRUCTURE & Other Observations
DRILLING & CASING	DRILLING FLUID											0	5	10	15	20	
					19.0	6.0			Silty CLAY: high plasticity, grey, mottled brown, trace fine grained sand (continued)	M	St						ALLUVIUM
																	6.20: HP samp =200 kPa
																	6.70: HP samp =250 kPa
				7.00m SPT 5 6,10,9 N=19	18.0	7.0		CH	trace fine grained angular gravel, trace fine to coarse grained sand								
				7.45m						W	VSt						

METHOD
HA Hand auger
AS Auger screwing
ADV Auger drilling with V bit
ADT Auger drilling with TC bit
HF Hollow flight auger
WB Wash-bore drilling
RR Rock roller
SD Sonic drilling
NDD Non destructive drilling
PT Continuous push tub
HAND Hand methods

PENETRATION
No Resistance
Very Hard / Refusal
dd/mm/yy
Level on Date shown
Drilling water level
water inflow
water outflow

SAMPLES & FIELD TESTS
B Bulk Disturbed Sample
D Disturbed Sample
U Undisturbed Sample
ES Environmental Sample
W Water Sample
HP Hand Penetrometer (kPa)
SPT Standard Penetration Test
N Result of SPT (*=sample taken)
R Hammer Bouncing / Refusal
U50 Undisturbed Sample (50mm dia)
U75 Undisturbed Sample (75mm dia)
VS Vane Shear; peak/remoulded(kPa)
PT Push Tube
MC Moisture Content

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D Dry
M Moist
W Wet
PL Plastic limit
LL Liquid limit

CONSISTENCY/ RELATIVE DENSITY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

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

SMEC AUSTRALIA



HOLE NO : BH04

PROJECT NUMBER : 30041864

SHEET : 1 OF 2

FINAL DEPTH : 9.95 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT: McGregor Road Automotive Destination

POSITION : E: 365132.0, N: 5781966.0 (MGA94 Zone 55)

SURFACE ELEVATION : 16.20 (m AHD)

INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig

MOUNTING : track

CONTRACTOR : Apex

HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC

CHECKED BY : ZW

[illegible]

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

SMEC AUSTRALIA



HOLE NO : BH04

PROJECT NUMBER : 30041864

SHEET : 2 OF 2

FINAL DEPTH : 9.95 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT: McGregor Road Automotive Destination

POSITION : E: 365132.0, N: 5781966.0 (MGA94 Zone 55)

SURFACE ELEVATION : 16.20 (m AHD)

INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig

MOUNTING : track

CONTRACTOR : Apex

HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC

CHECKED BY : ZW

DRILLING										MATERIAL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
PROGRESS		VE		F		VH		SAMPLES & FIELD TESTS		ELEVATION		DEPTH (m)		GRAPHIC LOG		CLASSIFICATION SYMBOL		MATERIAL DESCRIPTION		MOISTURE CONDITION		CONSISTENCY RELATIVE DENSITY		DCP BLOWS PER 100 mm		STRUCTURE & Other Observations																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA



HOLE NO : BH05

PROJECT NUMBER : 30041864

SHEET : 1 OF 4

FINAL DEPTH : 19.6 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT: McGregor Road Automotive Destination

POSITION : E: 365008.0, N: 5781914.0 (MGA94 Zone 55)

SURFACE ELEVATION : 15.60 (m AHD)

INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig

MOUNTING : track

CONTRACTOR : Apex

HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC

CHECKED BY : ZW

[illegible]

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

SMEC AUSTRALIA



HOLE NO : BH05

PROJECT NUMBER : 30041864

SHEET · 2 OF 4

FINAL DEPTH : 19.6 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT: McGregor Road Automotive Destination

POSITION : E: 365008.0, N: 5781914.0 (MGA94 Zone 55)

SURFACE ELEVATION : 15.60 (m AHD)

INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig

MOUNTING : track

CONTRACTOR : Apex

HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC

CHECKED BY : ZW

DRILLING						MATERIAL																																																																		
PROGRESS		VE F PENETRATION	WH GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm	STRUCTURE & Other Observations																																																											
DRILLING & CASING FLUID	DRILLING FLUID																																																																							
AS	WB			SPT 4 3,4,8 N=12	6.0		CH	Silty CLAY: high plasticity, grey, mottled brown, trace fine grained sand	M	St	<table><tr><td>0</td><td>5</td><td>10</td><td>15</td><td>20</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>	0	5	10	15	20																																																								ALLUVIUM
				0	5							10	15	20																																																										
6.45m	19.0																																																																							
7.00m	7.00m																																																																							
7.50m	18.0																																																																							
SPT 5 9,13,16 N=29	7.95m	8.0																																																																						
9.00m	17.0																																																																							
SPT 6 6,7,10 N=17	9.45m	9.0																																																																						
16.0	16.0																																																																							
10.0	10.0																																																																							
10.50m	15.0																																																																							
SPT 7 8,10,14 N=24	10.95m	11.0																																																																						
11.50m	14.0																																																																							
12.00m	12.0																																																																							
METHOD HA Hand auger AS Auger screwing ADV Auger drilling with V bit ADT Auger drilling with TC bit HF Hollow flight auger WB Wash-bore drilling RR Rock roller SD Sonic drilling NDD Non destructive drilling PT Continuous push tub HAND Hand methods				PENETRATION WATER dd/mm/yy Level on Date shown Drilling water level water inflow water outflow				SAMPLES & FIELD TESTS B Bulk Disturbed Sample D Disturbed Sample U Undisturbed Sample ES Environmental Sample W Water Sample HP Hand Penetrometer (kPa) SPT Standard Penetration Test N Result of SPT (*=sample taken) R Hammer Bouncing / Refusal U50 Undisturbed Sample (50mm dia) U75 Undisturbed Sample (75mm dia) VS Vane Shear; peak/remoulded(kPa) PT Push Tube MC Moisture Content				CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet PL Plastic limit LL Liquid limit				CONSISTENCY/ RELATIVE DENSITY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard Fb - Friable VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense																																																								

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

SMEC AUSTRALIA



NON-CORE DRILL HOLE - ENGINEERING LOG

HOLE NO : BH05
PROJECT NUMBER : 30041864
SHEET : 3 OF 4
FINAL DEPTH : 19.6 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 365008.0, N: 5781914.0 (MGA94 Zone 55) **SURFACE ELEVATION :** 15.60 (m AHD) **INCLINATION° / ORIENTATION° :** 90° / N/A

RIG TYPE : Drill Rig **MOUNTING :** track **CONTRACTOR :** Apex **HOLE DIA :** 100 mm

DATE STARTED : 23/01/2019 **DATE COMPLETED :** 23/01/2019 **DATE LOGGED :** 23/01/2019 **LOGGED BY :** SC **CHECKED BY :** ZW

DRILLING							MATERIAL													
PROGRESS		VE	F. PENETRATION VH	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm					STRUCTURE & Other Observations	
DRILLING & CASING	DRILLING FLUID									SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components	ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components			0	5	10	15	20		
WB					SPT 8 10,13,15 N=28	12.0			CL-CI	Silty CLAY: low to medium plasticity, brown, mottled grey and white, with fine to coarse grained sand, trace fine gravel <i>(continued)</i>		M	VSt						ALLUVIUM	
					12.45m				12.50m											
						3.0														
							13.0			SP	SAND: medium to coarse grained, brown, with fines		W	MD						
						13.50m	12.0				13.50m									RESIDUAL SOIL
						SPT 9 12,17,24 N=41														
						13.95m														
							14.0													
						11.0														
					15.00m	15.0			CL-CI	becoming brown, mottled grey and dark grey		M	H							
					SPT 10 12,33,20@30mm N=HB															
					15.45m															
						10.0														
						16.0														
					16.50m	16.50				16.50m										
					SPT 11 20,31@120mm N=R															
					16.95m															
						17.0														
					18.00m	18.00				18.00m										
														</						

METHOD
 HA Hand auger
 AS Auger screwing
 ADV Auger drilling with V bit
 ADT Auger drilling with TC bit
 HF Hollow flight auger
 WB Wash-bore drilling
 RR Rock roller
 SD Sonic drilling
 NDD Non destructive drilling
 PT Continuous push tub
 HAND Hand methods

PENETRATION

 No Resistance
 Very Hard / Refusal
WATER
 dd/mm/yy
 Level on Date shown
 Drilling water level
 water inflow
 water outflow

SAMPLES & FIELD TESTS
 B Bulk Disturbed Sample
 D Disturbed Sample
 U Undisturbed Sample
 ES Environmental Sample
 W Water Sample
 HP Hand Penetration Test
 SPT Standard Penetration Test
 N Result of SPT (*=sample taken)
 R Hammer Bouncing / Refusal
 U50 Undisturbed Sample (50mm dia)
 U75 Undisturbed Sample (75mm dia)
 VS Vane Shear; peak/remoulded(kPa)
 PT Push Tube
 MC Moisture Content

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
 Based on Unified Classification System

MOISTURE
 D Dry
 M Moist
 W Wet
 PL Plastic limit
 LL Liquid limit

CONSISTENCY/ RELATIVE DENSITY
 VS - Very Soft
 S - Soft
 F - Firm
 St - Stiff
 VSt - Very Stiff
 H - Hard
 Fb - Friable
 VL - Very Loose
 L - Loose
 MD - Medium Dense
 D - Dense
 VD - Very Dense

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

SMEC AUSTRALIA



NON-CORE DRILL HOLE - ENGINEERING LOG

HOLE NO : BH05
PROJECT NUMBER : 30041864
SHEET : 4 OF 4
FINAL DEPTH : 19.6 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 365008.0, N: 5781914.0 (MGA94 Zone 55) SURFACE ELEVATION : 15.60 (m AHD) INCLINATION° / ORIENTATION° : 90° / N/A

RIG TYPE : Drill Rig MOUNTING : track CONTRACTOR : Apex HOLE DIA : 100 mm

DATE STARTED : 23/01/2019 DATE COMPLETED : 23/01/2019 DATE LOGGED : 23/01/2019 LOGGED BY : SC CHECKED BY : ZW

DRILLING							MATERIAL								
PROGRESS		F. PENETRATION		GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	DCP BLOWS PER 100 mm	STRUCTURE & Other Observations
DRILLING & CASING	DRILLING FLUID	VE	VH												
WB	↓				SPT 12 9,17,28 N=45	18.0			CH	SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	D	H	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	RESIDUAL SOIL	
					18.45m	-3.0	Silty CLAY: high plasticity, brown, mottled grey, with fine to coarse grained sand, trace fine gravel								
					19.50m SPT 13 22@75mm N=R	-4.0			with fine, angular gravel						
					19.60m				19.60m	Hole Terminated at 19.60 m Target Depth					
					19.95m	-4.0									
						-5.0									
						-6.0									
						-7.0									
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METHOD
HA Hand auger
AS Auger screwing
ADV Auger drilling with V bit
ADT Auger drilling with TC bit
HF Hollow flight auger
WB Wash-bore drilling
RR Rock roller
SD Sonic drilling
NDD Non destructive drilling
PT Continuous push tub
HAND Hand methods

PENETRATION
No Resistance
Very Hard / Refusal
WATER
dd/mm/yy
Level on Date shown
Drilling water level
water inflow
water outflow

SAMPLES & FIELD TESTS
B Bulk Disturbed Sample
D Disturbed Sample
U Undisturbed Sample
ES Environmental Sample
W Water Sample
HP Hand Penetration Test
SPT Standard Penetration Test
N Result of SPT (*=sample taken)
R Hammer Bouncing / Refusal
U50 Undisturbed Sample (50mm dia)
U75 Undisturbed Sample (75mm dia)
VS Vane Shear; peak/remoulded(kPa)
PT Push Tube
MC Moisture Content

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

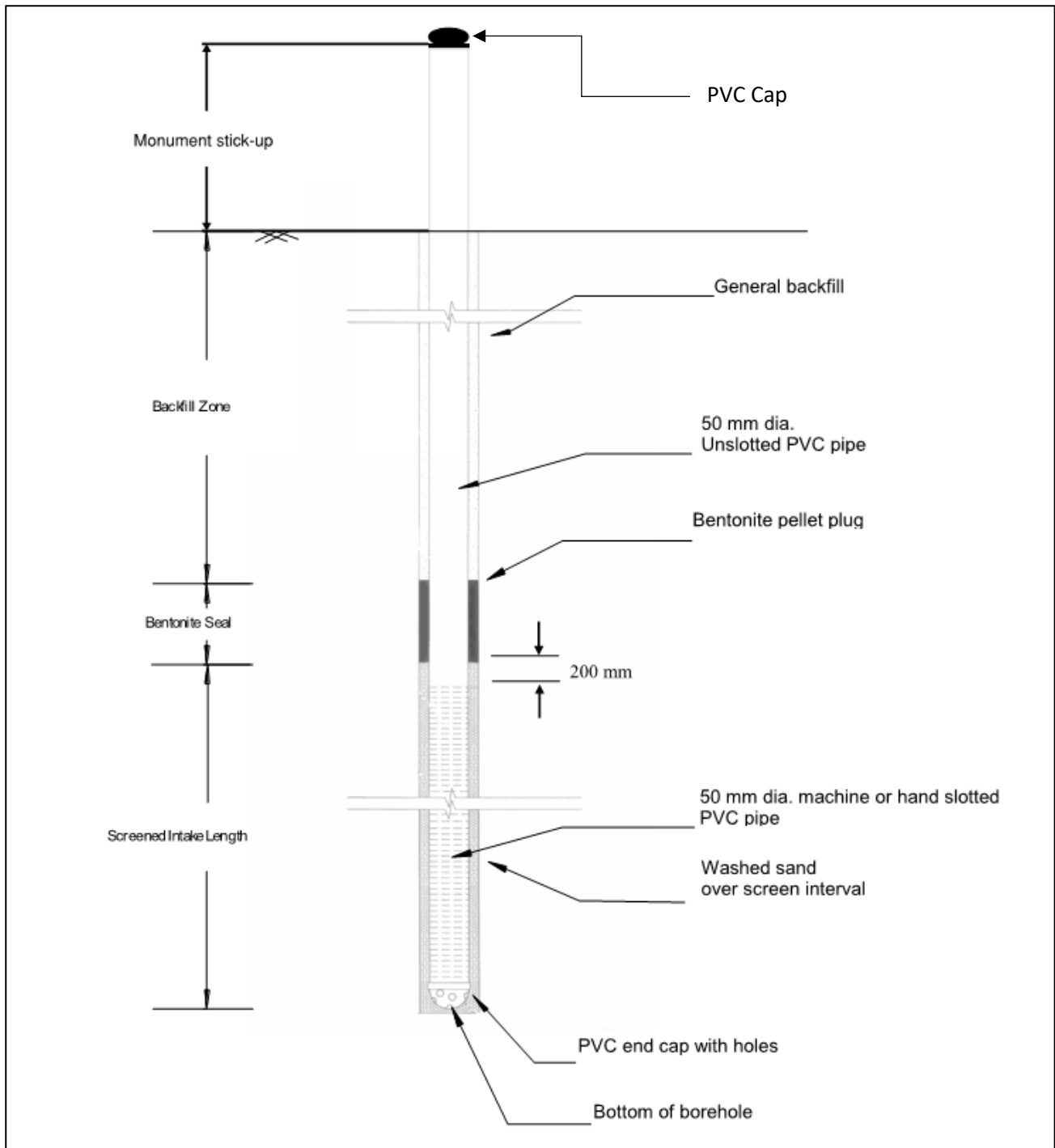
MOISTURE
D Dry
M Moist
W Wet
PL Plastic limit
LL Liquid limit

CONSISTENCY/ RELATIVE DENSITY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense


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

SMEC AUSTRALIA





As Constructed	Depth Interval (m) Below Surface		Ground Surface RL	
BORE	From	To	15.6 m AHD	
Monument stick-up	-0.75	0		
Backfill zone	0	5.5		Note: Standpipe installed as a monument
Bentonite seal	5.5	6.5		
Unslotted PVC section	0	8		
Washed sand backfill	6.5	20		
Screened intake section	8	14		
Borehole toe level		20		

 Member of the Surbana Jurong Group	BH05 STANDPIPE CONSTRUCTION DETAILS Project: McGregor Rd Automotive Destination – Geotechnical Investigation	Project No: 30041864
		Revision: Rev0
		Date: 30/01/2019
		Prepared By: Stefan Chenoweth

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP01
PROJECT NUMBER : 30041864
SHEET : 1 OF 1
FINAL DEPTH : 2 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 364358.0, N: 5781967.0 (MGA94 Zone 55)

SURFACE ELEVATION : 14.80 (m AHD)

EQUIPMENT TYPE : 5 tonne excavator

METHOD : excavator bucket (500mm width)

DATE EXCAVATED : 17/01/2019

LOGGED BY : SC

CHECKED BY : ZW

EXCAVATION DIMENSIONS : 3.00 m LONG 0.50 m WIDE

DRILLING						MATERIAL								
VE	E	F	H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm	STRUCTURE & Other Observations
<div></div>	<div></div>	<div></div>	<div></div>	No Support	Not Encountered		0.0	<div></div>	CL	Silty CLAY: low plasticity, grey, with rootlets	D	Fr	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></di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PHOTOGRAPHS NOTES



YES



NO

METHOD	PENETRATION	SAMPLES & FIELD TESTS	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY
N Natural Exposure X Existing Excavation BB Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	<p>10 Oct., 73 Water Level on Date shown</p> <p>water inflow</p> <p>water outflow</p>	U Undisturbed Sample D Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) VS Vane Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	Based on Unified Classification System MOISTURE D Dry M Moist W Wet	VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense

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

SMEC AUSTRALIA





TP01 - 1 Depth Range: 0.00 m - 0.30m



TP01 - 2 Depth Range: 0.30m - 1.00m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	1/2



TP01 - 3 Depth Range: 1.00m - 2.00m



TP01 - 4 Depth Range: 0.00m - 2.00m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	2/2

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP02
PROJECT NUMBER : 30041864
SHEET : 1 OF 1
FINAL DEPTH : 2 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 364417.0, N: 5781584.0 (MGA94 Zone 55)

SURFACE ELEVATION : 13.60 (m AHD)

EQUIPMENT TYPE : 5 tonne excavator

METHOD : excavator bucket (500mm width)

DATE EXCAVATED : 17/01/2019

LOGGED BY : SC

CHECKED BY : ZW

EXCAVATION DIMENSIONS : 3.00 m LONG 0.50 m WIDE

DRILLING				MATERIAL				
VE	PE	HP	SUPPORT	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	STRUCTURE & Other Observations
			No Support	0.0		CL	Silty CLAY: low plasticity, dark grey, with rootlets	TOPSOIL 0.00: tall grasses on surface
			Not Encountered	0.10m			Silty CLAY: high plasticity, dark grey, trace sand, trace rootlets	ALLUVIUM
				0.40m				0.20: PP In-situ >400 kPa
				0.5				0.50: PP In-situ >400 kPa
				0.80m			becoming brown, mottled grey and dark grey	0.60: PP In-situ =400 kPa
				1.0		CH	becoming grey, mottled brown and dark grey	0.80: PP In-situ =350 kPa
				1.5				1.00: PP In-situ =300 kPa 1.00: rootlets to 1m
				2.0			Hole Terminated at 2.00 m Target Depth	1.20: PP In-situ =250 kPa
				2.5				1.50: PP In-situ =200 kPa
				3.0				1.70: PP In-situ =150 kPa
								2.00: PP In-situ =150 kPa

PHOTOGRAPHS
NOTES



YES

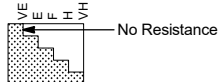


NO

METHOD

N Natural Exposure
X Existing Excavation
BB Backhoe Bucket
B Bulldozer Blade
R Ripper
EX Hydraulic Excavator
EH Excavator with Hammer
SUPPORT
T Timbering

PENETRATION



WATER

10 Oct., 73 Water
Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS

U Undisturbed Sample
D Disturbed Sample
B Bulk Disturbed Sample
MC Moisture Content
HP Hand Penetrometer (kPa)
VS Vane Shear; P-Peak,
R-Remoulded (uncorrected kPa)
PBT Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION

Based on Unified Classification System

MOISTURE

D Dry
M Moist
W Wet

CONSISTENCY/ RELATIVE DENSITY

VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

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

SMEC AUSTRALIA





TP02 - 1 Depth Range: 0.00m - 1.00m



TP02 - 2 Depth Range: 1.00m - 2.00m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	1/2



TP02 - 3 Depth Range: 0.00m - 2.00m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	2/2

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP03
PROJECT NUMBER : 30041864
SHEET : 1 OF 1
FINAL DEPTH : 2 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 364725.0, N: 5782023.0 (MGA94 Zone 55)

SURFACE ELEVATION : 15.80 (m AHD)

EQUIPMENT TYPE : 5 tonne excavator

METHOD : excavator bucket (500mm width)

DATE EXCAVATED : 17/01/2019

LOGGED BY : SC

CHECKED BY : ZW

EXCAVATION DIMENSIONS : 3.00 m LONG 0.50 m WIDE

DRILLING				MATERIAL						
VE PENETRATION F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm	STRUCTURE & Other Observations
	No Support	Not Encountered		0.0		CL	CLAY: low plasticity, brown, with rootlets	Fr	0 5 10 15 20	TOPSOIL 0.00: long grasses on surface
				0.10m	Silty CLAY: high plasticity, dark grey, mottled brown, with fine to coarse grained sand, trace rootlets becoming brown, mottled grey and red	D	Vst - H	10	ALLUVIUM	
				15				0.30: PP In-situ >400 kPa		
				20				0.40: rootlets to 0.4m		
				25				0.60: PP In-situ >400 kPa		
				30				0.70: PP In-situ =350 kPa		
				35				0.90: PP In-situ =300 kPa		
				40				1.20: PP In-situ =300 kPa		
				45				1.50: PP In-situ =300 kPa		
				50				1.80: PP In-situ =200 kPa		
0.80m	B-1									
				2.0			Hole Terminated at 2.00 m Target Depth			
				2.5						
				3.0						



TP03 - 1 Depth Range: 0.00m - 0.30m



TP03 - 2 Depth Range: 0.30m - 0.70m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	1/2



TP03 - 3 Depth Range: 0.70m - 2.00m



TP03 - 4 Depth Range: 0.00m - 2.00m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	2/2

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP04
PROJECT NUMBER : 30041864
SHEET : 1 OF 1
FINAL DEPTH : 2 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 365050.0, N: 5781784.0 (MGA94 Zone 55)

SURFACE ELEVATION : 15.00 (m AHD)

EQUIPMENT TYPE : 5 tonne excavator

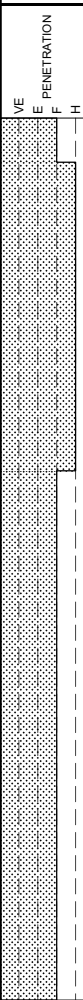

METHOD : excavator bucket (500mm width)

DATE EXCAVATED : 17/01/2019

LOGGED BY : SC

CHECKED BY : ZW

EXCAVATION DIMENSIONS : 3.00 m LONG 0.50 m WIDE

DRILLING				MATERIAL								
VE E F H	PENETRATION	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm	STRUCTURE & Other Observations
	No Support	Not Encountered	0.30m B-1	0.70m B-2	0.0		CL	Silty CLAY: low plasticity, dark grey, with rootlets	D	Fr	0	TOPSOIL 0.00: grazed grass on surface
					0.10m		Silty CLAY: high plasticity, dark grey, with fine to coarse grained sand, trace rootlets	5		ALLUVIUM 0.20: PP In-situ >400 kPa		
					0.30		becoming grey, mottled dark grey and brown	10		0.50: PP In-situ >400 kPa 0.50: rootlets to 0.5m		
					0.50		becoming brown, mottled pale grey and dark grey	15		0.80: PP In-situ >400 kPa		
					0.70			20		1.20: PP In-situ =350 kPa		
					0.90			25		1.50: PP In-situ =350 kPa		
					1.10			30		1.80: PP In-situ =300 kPa		
					1.30			35				
					1.50			40				
					1.70			45				
1.90		50										
2.00					2.00m		Hole Terminated at 2.00 m Target Depth				2.00: PP In-situ =300 kPa	
					2.5							
					3.0							

PHOTOGRAPHS NOTES



YES



NO

METHOD	PENETRATION	SAMPLES & FIELD TESTS	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System	CONSISTENCY/ RELATIVE DENSITY
N Natural Exposure X Existing Excavation BB Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	<p>10 Oct., 73 Water Level on Date shown</p> <p>water inflow</p> <p>water outflow</p>	U Undisturbed Sample D Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) VS Vane Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	D Dry M Moist W Wet	VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense

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

SMEC AUSTRALIA





TP04 - 1 Depth Range: 0.00m - 0.30m



TP04 - 2 Depth Range: 0.30m - 1.00m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	1/2



TP04 - 3 Depth Range: 0.00 m



TP04 - 4 Depth Range: 0.00 m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	2/2

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP05
PROJECT NUMBER : 30041864
SHEET : 1 OF 1
FINAL DEPTH : 2 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 364849.0, N: 5781594.0 (MGA94 Zone 55)

SURFACE ELEVATION : 13.40 (m AHD)

EQUIPMENT TYPE : 5 tonne excavator

METHOD : excavator bucket (500mm width)

DATE EXCAVATED : 17/01/2019

LOGGED BY : SC

CHECKED BY : ZW

EXCAVATION DIMENSIONS : 3.00 m LONG 0.50 m WIDE

DRILLING				MATERIAL							
VE PENETRATION F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm	STRUCTURE & Other Observations
	No Support	Not Encountered		0.0		CL	Silty CLAY: low plasticity, dark grey, with rootlets	D	Fr	0	TOPSOIL 0.00: grazed grass on surface
				0.10m			Silty CLAY: high plasticity, dark grey, trace sand, trace fine gravel, trace rootlets	D		5	ALLUVIUM
				0.50m						10	0.20: PP In-situ >400 kPa
			B-1	0.5					H	15	0.50: PP In-situ >400 kPa
				1.00m			becoming grey, mottled brown and dark grey			20	0.80: PP In-situ >400 kPa 0.80: rootlets to 0.8m
			DS-1	1.0		CH	becoming brown, mottled grey, dark grey and red			25	1.00: PP In-situ >400 kPa
				1.5				M		30	1.20: PP In-situ =350 kPa
				2.0				VSt		35	1.50: PP In-situ =350 kPa
				2.00m			Hole Terminated at 2.00 m Target Depth			40	1.80: PP In-situ =300 kPa
				2.5						45	2.00: PP In-situ =300 kPa
				3.0						50	

PHOTOGRAPHS NOTES



YES



NO

METHOD	PENETRATION	SAMPLES & FIELD TESTS	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY
N Natural Exposure X Existing Excavation BB Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	<p>10 Oct., 73 Water Level on Date shown</p> <p>water inflow</p> <p>water outflow</p>	U Undisturbed Sample D Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) VS Vane Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	Based on Unified Classification System MOISTURE D Dry M Moist W Wet	VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense

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

SMEC AUSTRALIA





TP05 - 1 Depth Range: 0.00 m



TP05 - 2 Depth Range: 0.00 m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	1/2



TP05 - 3 Depth Range: 1.00m - 2.00m



TP05 - 4 Depth Range: 0.00m - 2.00m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	2/2

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP06
PROJECT NUMBER : 30041864
SHEET : 1 OF 1
FINAL DEPTH : 2 m

CLIENT : Podium 1
LOCATION : Pakenham

PROJECT : McGregor Road Automotive Destination

POSITION : E: 365162.0, N: 5781470.0 (MGA94 Zone 55)

SURFACE ELEVATION : 13.80 (m AHD)

EQUIPMENT TYPE : 5 tonne excavator

METHOD : excavator bucket (500mm width)

DATE EXCAVATED : 17/01/2019

LOGGED BY : SC

CHECKED BY : ZW

EXCAVATION DIMENSIONS : 3.00 m LONG 0.50 m WIDE

DRILLING				MATERIAL										
VE PENETRATION F H	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY	DCP BLOWS PER 100 mm	STRUCTURE & Other Observations				
	No Support	Not Encountered		0.0		CL	Silty CLAY: low plasticity, dark grey, with rootlets	D	Fr	TOPSOIL 0.00: grazed grass on surface				
				0.10m		Sandy CLAY: low to medium plasticity, dark grey, fine to coarse grained sand, trace rootlets	D	VSt - H	ALLUVIUM					
				0.30m						B-1	0.30: PP In-situ >400 kPa			
				0.5						CL-CI	0.60: PP In-situ >400 kPa			
				0.80m						Silty CLAY: medium to high plasticity, grey, mottled brown and dark brown, trace fine grained gravel becoming brown, mottled pale grey, dark grey and red	M	VSt	1.00: PP In-situ >400 kPa	
				1.20: PP In-situ =300 kPa										
				1.50m									B-2	1.50: PP In-situ =250 kPa
				1.70: PP In-situ =150 kPa										
				1.90: PP In-situ =100 kPa										
				2.0									Hole Terminated at 2.00 m Target Depth	
2.5														
3.0														

PHOTOGRAPHS
NOTES



YES

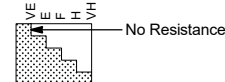


NO

METHOD

N Natural Exposure
X Existing Excavation
BB Backhoe Bucket
B Bulldozer Blade
R Ripper
EX Hydraulic Excavator
EH Excavator with Hammer
SUPPORT
T Timbering

PENETRATION



WATER

10 Oct., 73 Water
Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS

U Undisturbed Sample
D Disturbed Sample
B Bulk Disturbed Sample
MC Moisture Content
HP Hand Penetrometer (kPa)
VS Vane Shear; P-Peak,
R-Remoulded (uncorrected kPa)
PBT Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION

Based on Unified
Classification System

MOISTURE

D Dry
M Moist
W Wet

CONSISTENCY/ RELATIVE DENSITY

VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

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

SMEC AUSTRALIA





TP06 - 1 Depth Range: 0.00m - 0.30m



TP06 - 2 Depth Range: 0.30m - 1.00m



TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	1/2



TP06 - 3 Depth Range: 1.00m - 2.00m



TP06 - 4 Depth Range: 0.00m - 2.00m

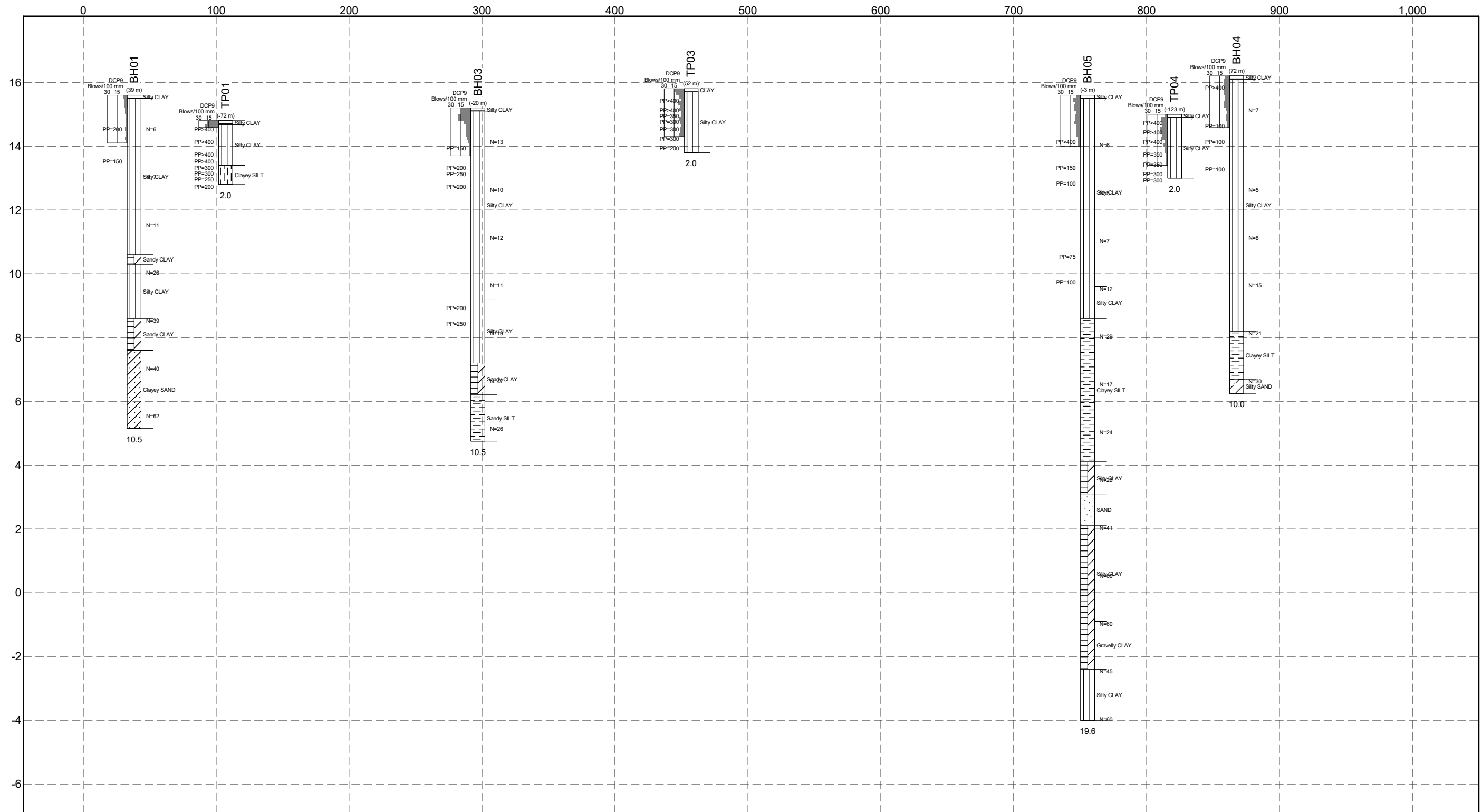


TITLE Podium 1 SC McGregor Road Automotive Destination Geotechnical Investigation	DRAWN	SC	DATE	21/01/2019
	CHECKED	ZW	DATE	21/01/2019
	SCALE	Not To Scale		A4
	PROJECT No	30041864	FIGURE No	2/2

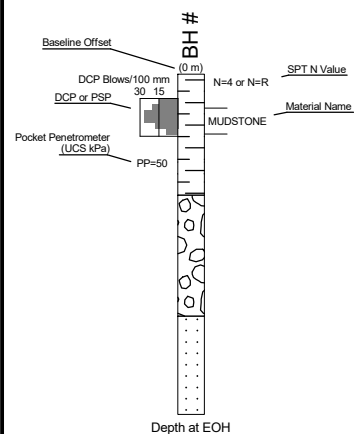
Appendix C Inferred Geological Sections

Penetration: FENCE A3, NO PLAN, MCGREGOR RD AUTOMOTIVE DESTINATION GINT.GPJ | LIR SEMC 1.06.5 | LIR SEMC 1.06.0

ELEVATION (m m AHD)

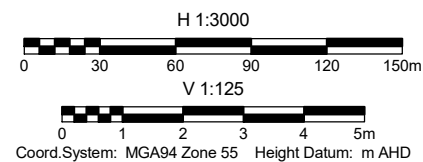


POST LEGEND



MATERIAL GRAPHIC

- | | | |
|---------------------------------------|---------------------------|-------------------------|
| CH - High Plasticity CLAY | MH - High Plasticity SILT | SM - Silty SAND |
| CL - Low Plasticity CLAY | ML - Low Plasticity SILT | SP - Poorly Graded SAND |
| CL-CI - Low to Medium Plasticity CLAY | SC - Clayey SAND | |

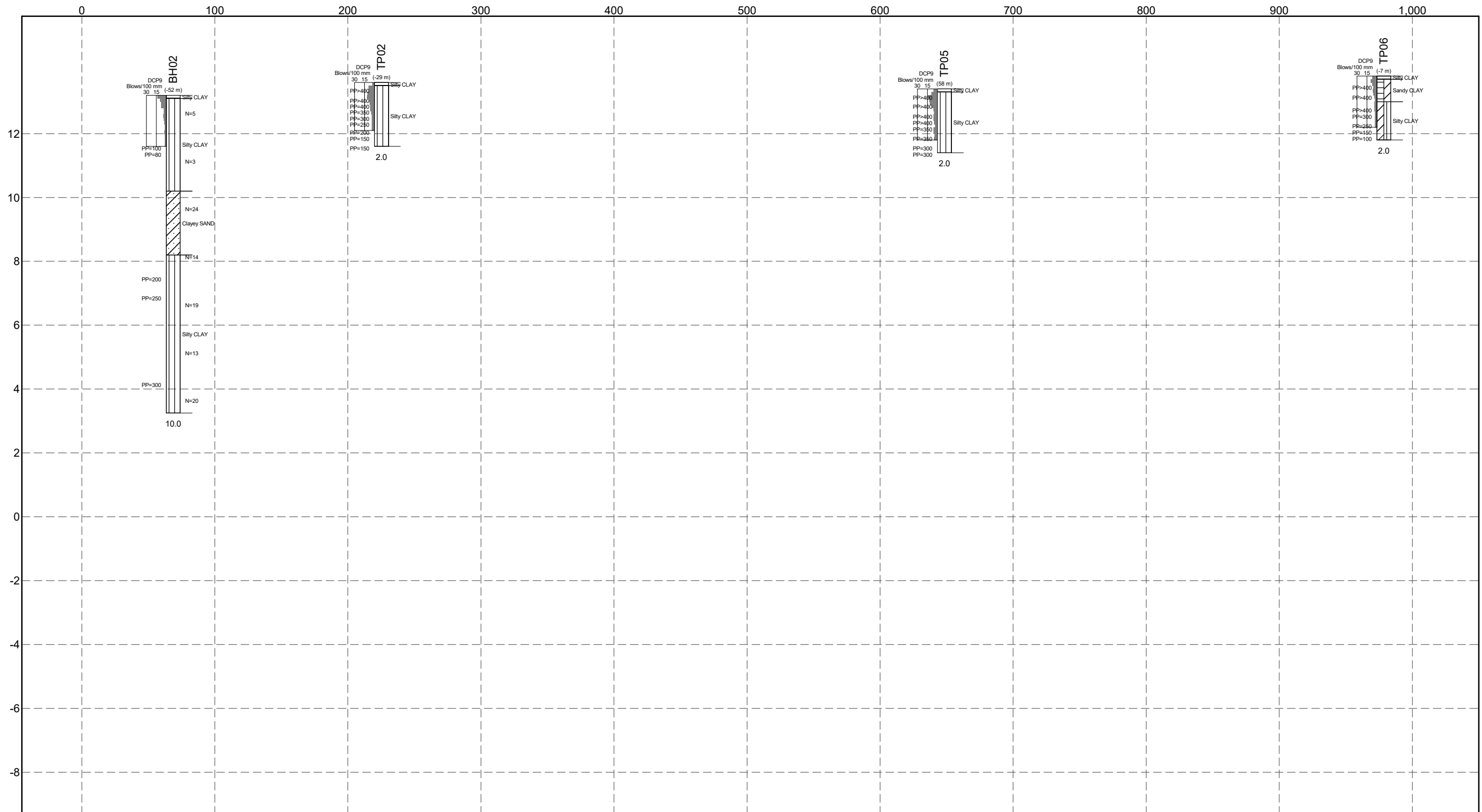


TITLE
Podium 1
McGregor Road Automotive Destination
Geotechnical Investigation - A-A' Long Section

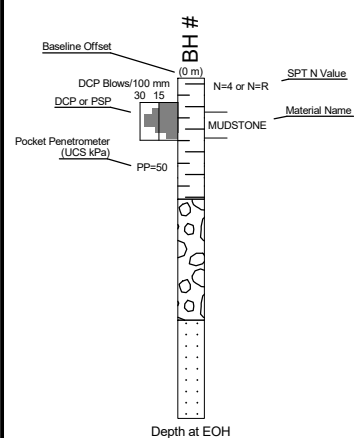
DRAWN	SC	DATE	4/06/2019
CHECKED	ZW	DATE	4/06/2019
SCALE	H 1:3000 V 1:125		A3
PROJECT No	30041864	FIGURE No	

Fence FENCEA3, NO PLAN MCGREGOR RD AUTOMOTIVE DESTINATION GINT.GPJ | Ltr SEMC 1.06.5 Ltr Pjt SMEC 1.06.0

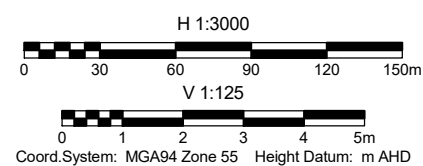
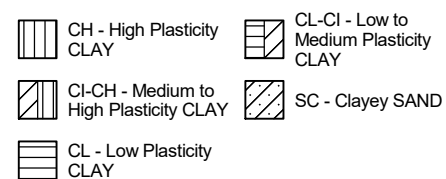
ELEVATION (m m AHD)



POST LEGEND



MATERIAL GRAPHIC



TITLE Podium 1 McGregor Road Automotive Destination Geotechnical Investigation - B-B' Long Section		DRAWN SC	DATE 4/06/2019
		CHECKED ZW	DATE 4/06/2019
SCALE H 1:3000 V 1:125		A3	
PROJECT No 30041864		FIGURE No	

Appendix D Laboratory Results

Material Test Report

Client: SMEC
Address: Collins Square, Tower 4, Level 20, 727 Collins St
 MELBOURNE VIC 3008
Project: McGregor Road, Pakenham
Project No.: 1009508
Order No.:
TRN:

CG Request No.:
Lot No.:



Accredited for compliance with ISO/IEC 17025
 – Testing



The results of the tests, calibrations and/or
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 traceable to Australian/national standards.

Approved Signatory: J. Lamont
 (Dandenong Laboratory Manager)

12712

Date of Issue: 19/02/2019

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Sample Details

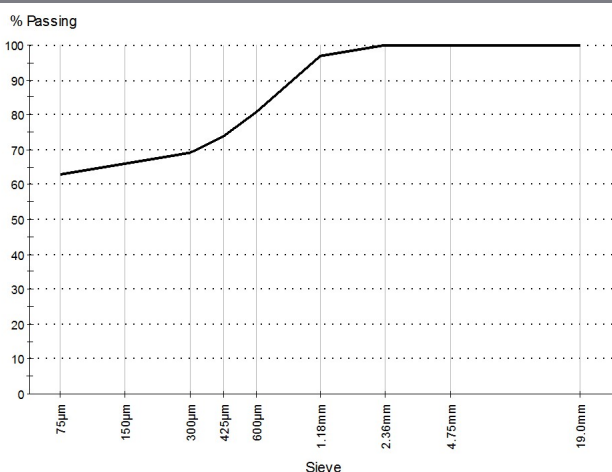
Sample Location TP06, 0.3m to 0.5m
Field Sample ID 2
Date Sampled 17/01/2019
Source In-Situ
Material Silty Clay
Specification AS Grading
Sampling Method Submitted by client
Sample ID S19DS-00999

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	9.0	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	11.0	
Mould Length (mm)		125	
Crumbling		No	

Particle Size Distribution

AS 1289.3.6.1



Drying by: Oven

Date Tested: 6/02/2019

Note: Sample Washed

Sieve Size	% Passing	Limits
19.0mm	100	
4.75mm	100	
2.36mm	100	
1.18mm	97	
600µm	81	
425µm	74	
300µm	69	
150µm	66	
75µm	63	

Comments


N/A

Material Test Report

Client: SMEC
Address: Collins Square, Tower 4, Level 20, 727 Collins St
 MELBOURNE VIC 3008
Project: McGregor Road, Pakenham
Project No.: 1009508

Order No.: **CG Request No.:**
TRN: **Lot No.:**

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 – Testing



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Approved Signatory: J. Lamont
 (Dandenong Laboratory Manager)
 Date of Issue: 19/02/2019

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Other Test Results

Description	Method	Result	Limits
Curling		Yes	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.2	34	
Plastic Limit (%)	AS 1289.3.2.1	13	
Plasticity Index (%)	AS 1289.3.3.1	21	

Comments

N/A

Material Test Report

Client: SMEC
Address: Collins Square, Tower 4, Level 20, 727 Collins St
 MELBOURNE VIC 3008
Project: McGregor Road, Pakenham
Project No.: 1009508
Order No.:
TRN:

CG Request No.:
Lot No.:

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 – Testing

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Approved Signatory: J. Lamont
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 Date of Issue: 19/02/2019

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Sample Details

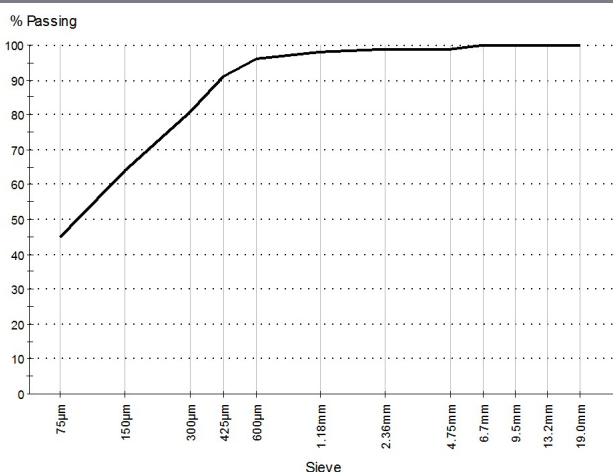
Sample Location BH03, 10.0m to 10.45m
Field Sample ID 5
Date Sampled 23/01/2019
Source In-Situ
Material silty SAND
Specification AS Grading
Sampling Method Submitted by client
Sample ID S19DS-01002

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	7.0	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	2.5	
Mould Length (mm)		250	
Crumbling		No	

Particle Size Distribution

AS 1289.3.6.1



Drying by: Oven
Date Tested: 7/02/2019

Note: Sample Washed

Sieve Size	% Passing	Limits
19.0mm	100	
13.2mm	100	
9.5mm	100	
6.7mm	100	
4.75mm	99	
2.36mm	99	
1.18mm	98	
600µm	96	
425µm	91	
300µm	81	
150µm	64	
75µm	45	

Comments

N/A



Dandenong South
ACN 143 009 330
25 Metcalf Street
DANDENONG SOUTH, VIC 3175

Ph: + 61 3 8796 7900
Fax: +61 3 9706 9431

Report No: MAT:S19DS-01002/1

Issue No: 1

Material Test Report

Client: SMEC
Address: Collins Square, Tower 4, Level 20, 727 Collins St
MELBOURNE VIC 3008
Project: McGregor Road, Pakenham
Project No.: 1009508

Order No.: **CG Request No.:**
TRN: **Lot No.:**



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(Dandenong Laboratory Manager)

Date of Issue: 19/02/2019

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Other Test Results

Description	Method	Result	Limits
Curling		No	
Cracking		Yes	
Liquid Limit (%)	AS 1289.3.1.2	19	
Plastic Limit (%)	AS 1289.3.2.1	13	
Plasticity Index (%)	AS 1289.3.3.1	6	

Comments

N/A

Material Test Report

Client: SMEC
Address: Collins Square, Tower 4, Level 20, 727 Collins St
 MELBOURNE VIC 3008
Project: McGregor Road, Pakenham
Project No.: 1009508
Order No.:
TRN:

CG Request No.:
Lot No.:



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 – Testing



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Date of Issue: 19/02/2019

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Sample Details

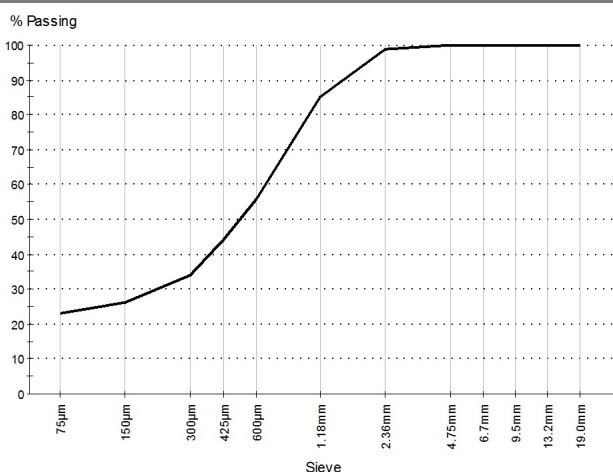
Sample Location BH02, 3.5m to 3.95m
Field Sample ID 6
Date Sampled 23/01/2019
Source In-Situ
Material Clayey Sand
Specification AS Grading
Sampling Method Submitted by client
Sample ID S19DS-01003

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	10.5	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	9.0	
Mould Length (mm)		125	
Crumbling		No	

Particle Size Distribution

AS 1289.3.6.1



Drying by: Oven
Date Tested: 7/02/2019

Note: Sample Washed

Sieve Size	% Passing	Limits
19.0mm	100	
13.2mm	100	
9.5mm	100	
6.7mm	100	
4.75mm	100	
2.36mm	99	
1.18mm	85	
600µm	56	
425µm	44	
300µm	34	
150µm	26	
75µm	23	

Comments


N/A

Material Test Report

Client: SMEC
Address: Collins Square, Tower 4, Level 20, 727 Collins St
MELBOURNE VIC 3008
Project: McGregor Road, Pakenham
Project No.: 1009508

Order No.: **CG Request No.:**
TRN: **Lot No.:**

Accredited for compliance with ISO/IEC 17025
– Testing



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Approved Signatory: J. Lamont
(Dandenong Laboratory Manager)
Date of Issue: 19/02/2019

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Other Test Results

Description	Method	Result	Limits
Curling		Yes	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.2	36	
Plastic Limit (%)	AS 1289.3.2.1	13	
Plasticity Index (%)	AS 1289.3.3.1	23	

Comments


N/A

California Bearing Ratio Test Report

Client: SMEC
Address: Collins Square, Tower 4, Level 20, 727 Collins St
MELBOURNE VIC 3008
Project: McGregor Road, Pakenham
Project No.: 1009508
Order No.:
TRN:

CG Request No.:
Lot No.:

Accredited for compliance with ISO/IEC 17025
– Testing



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Approved Signatory: J. Lamont
(Dandenong Laboratory Manager)
Date of Issue: 19/02/2019

Sample Details

Sample ID: S19DS-00998

Date Sampled: 17/01/2019

Sampled By: Client

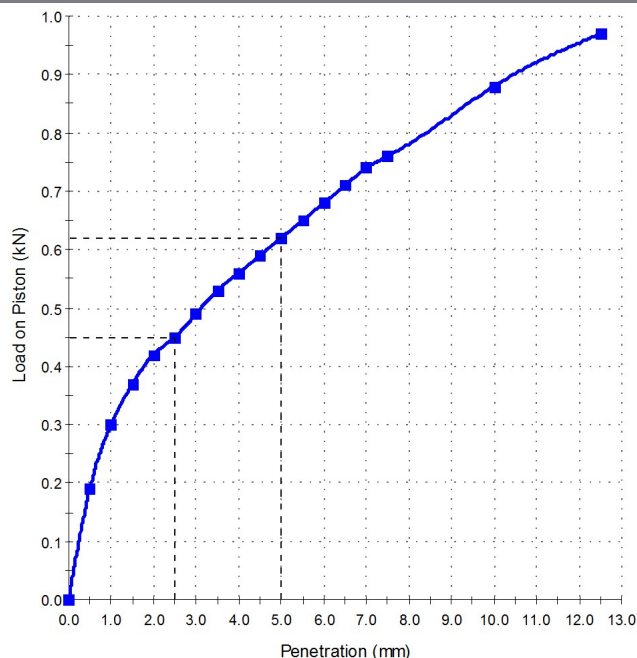
Material:

Location: TP01, 0.4m to 0.5m

Tested By: C. Ranaraja

Date Tested: 11/02/2019

Load vs Penetration



Test Results

AS 1289.6.1.1 - 2014

CBR At 2.5mm (%): **3.5**
Maximum Dry Density (t/m³): 1.89
Optimum Moisture Content (%): 12.0
Dry Density before Soaking (t/m³): 1.86
Density Ratio before Soaking (%): 98.0
Moisture Content before Soaking (%): 11.7
Moisture Ratio before Soaking (%): 98.0
Dry Density after Soaking (t/m³): 1.85
Density Ratio after Soaking (%): 98.0
Swell (%): 0.5
Moisture Content of Top 30mm (%): 15.4
Compactive Effort: Standard
AS 1289.5.1.1
Surcharge Mass (kg): 4.50
Period of Soaking (Days): 4
Oversize Material (%): 0
CBR Moisture Content Method: AS 1289.2.1.1
Date/Time Cure Start: 01/ 02/ 2019 00:00
Date/Time Cure End: 07/ 02/ 2019 00:00

Comments

California Bearing Ratio Test Report

Client: SMEC
Address: Collins Square, Tower 4, Level 20, 727 Collins St
 MELBOURNE VIC 3008
Project: McGregor Road, Pakenham
Project No.: 1009508
Order No.:
TRN:

CG Request No.:
Lot No.:

Accredited for compliance with ISO/IEC 17025
 – Testing

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Approved Signatory: J. Lamont
 (Dandenong Laboratory Manager)
 Date of Issue: 19/02/2019

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Sample Details

Sample ID: S19DS-00999

Date Sampled: 17/01/2019

Sampled By: Client

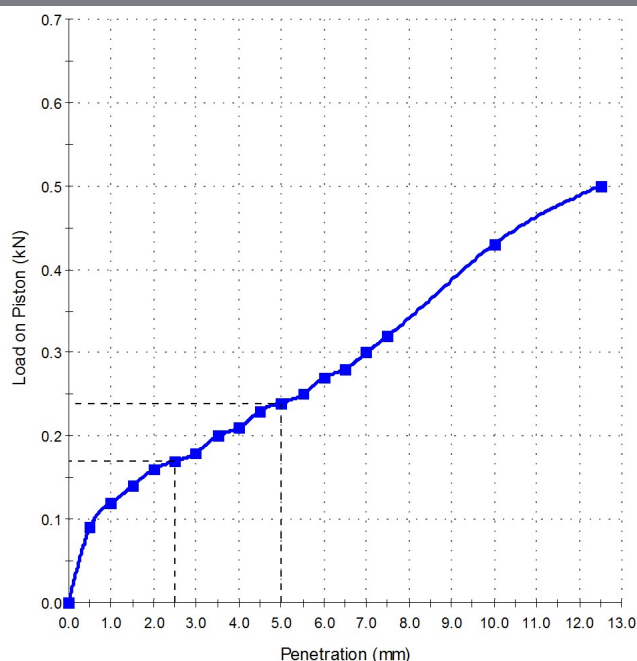
Material: Silty Clay

Location: TP06, 0.3m to 0.5m

Tested By: C. Ranaraja

Date Tested: 11/02/2019

Load vs Penetration



Test Results

AS 1289.6.1.1 - 2014

CBR At 2.5mm (%): **1.5**

Maximum Dry Density (t/m³): 1.86
 Optimum Moisture Content (%): 12.0
 Dry Density before Soaking (t/m³): 1.83
 Density Ratio before Soaking (%): 98.0
 Moisture Content before Soaking (%): 11.5
 Moisture Ratio before Soaking (%): 97.5
 Dry Density after Soaking (t/m³): 1.79
 Density Ratio after Soaking (%): 96.5
 Swell (%): 2.0
 Moisture Content of Top 30mm (%): 17.8
 Compactive Effort: Standard
 AS 1289.5.1.1

Surcharge Mass (kg): 4.50
 Period of Soaking (Days): 4
 Oversize Material (%): 0
 CBR Moisture Content Method: AS 1289.2.1.1

Date/Time Cure Start: 05/ 02/ 2019 00:00
 Date/Time Cure End: 07/ 02/ 2019 00:00

Comments

Head Office
25 Metcalf Street
DANDENONG SOUTH VIC 3175

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SHRINK SWELL TEST REPORT

Customer: SMEC Australia Pty Ltd
Customer Address: Collins Square, Tower 4, Level 20, 727 Collins St, MELBOURNE
Project: McGregor Road
Location: Pakenham
Customer Order No.: 30041864

Report Number: W19DS00262
Report Date: 15/02/2019
CG Job No: 1009508
Test Method: AS1289.7.1.1
Page: 1 of 1

Testing performed and reported at our Dandenong South Laboratory 12712

Sample No.:	S19DS-01000	S19DS-01001	
ID No:	3	4	
Lot No:	-	-	
Date Sampled	24/01/2019	24/01/2019	
Material Source:	In-Situ	In-Situ	
Sample Location:	BH04 2.5m to 2.86m	BH05 1.0m to 1.4m	
Material Description	Silty CLAY	Silty CLAY	
Sampling Procedure:	As Received	As Received	
SHRINK TEST AS1289 7.1.1 Clause 5.2			
Length of Specimen (mm)	126.6	126.8	
Mass of Specimen (g)	781.1	660.0	
Mass of Oven dried Specimen (g)	641.3	584.3	
Initial Moisture Content (w_3) % AS1289 2.1.1	21.8	13.0	
extent of soil cracking	Nil	Minor	
extent of soil crumbling	Nil	Moderate	
Shrinkage %	4.5	1.6	
SWELL TEST AS1289 7.1.1 Clause 5.1			
Load Device No	25	25	
Height of specimen (mm)	20	20	
Initial Moisture Content (w_1) % AS1289 2.1.1	23.4	15.9	
Final Moisture Content (w_2) % AS1289 2.1.1	24.5	25.4	
Swell %	-0.8	1.3	
SHRINK SWELL INDEX (I_{ss}) %	2.3	1.2	
estimated inert inclusions (%)	5	5	

Remarks: For sample Id S19DS-01001, this sample was in a fractured condition prior to testing.



Accredited for compliance with ISO/IEC 17025. The results of tests, calibrations and/or measurements included in this document are traceable to

APPROVED SIGNATORY

J Lamont

Form No.: CG.332.003

Issue Date: 04/06/2018

SMEC Australia Pty Ltd
Collins Square, Tower 4, Level 20, 727 Collins Street
Melbourne
VIC 3008



NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Zach Wong

Report 638822-S
Project name MCGREGOR RD AUTOMOTIVE DESTINATION
Project ID 30041864
Received Date Feb 04, 2019

Client Sample ID			BH02-0.6M-0.7M	BH05-6.2-6.3M
Sample Matrix			Soil	Soil
Eurofins mgt Sample No.			M19-Fe03540	M19-Fe03541
Date Sampled			Jan 23, 2019	Jan 23, 2019
Test/Reference	LOR	Unit		
Chloride	5	mg/kg	30	490
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	86	320
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	6.9	7.9
Sulphate (as SO ₄)	30	mg/kg	37	81
% Moisture	1	%	11	19

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Melbourne	Feb 07, 2019	28 Day
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Conductivity (1:5 aqueous extract at 25°C as rec.)	Melbourne	Feb 07, 2019	7 Day
- Method: LTM-INO-4030 Conductivity			
pH (1:5 Aqueous extract at 25°C as rec.)	Melbourne	Feb 07, 2019	7 Day
- Method: LTM-GEN-7090 pH in soil by ISE			
Sulphate (as SO ₄)	Melbourne	Feb 07, 2019	28 Day
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
% Moisture	Melbourne	Feb 05, 2019	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name: SMEC Australia Pty Ltd (VIC)
Address: Collins Square, Tower 4, Level 20, 727 Collins Street
Melbourne
VIC 3008
Project Name: MCGREGOR RD AUTOMOTIVE DESTINATION
Project ID: 30041864

Order No.:
Report #: 638822
Phone: 03 9514 1500
Fax: 03 9514 1502

Received: Feb 4, 2019 4:30 PM
Due: Feb 11, 2019
Priority: 5 Day
Contact Name: Zach Wong

Eurofins | mgt Analytical Services Manager : Cindi Guo

Sample Detail						Chloride	Conductivity (1:5 aqueous extract at 25°C as rec.)	pH (1:5 Aqueous extract at 25°C as rec.)	Sulphate (as SO ₄)	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X
Sydney Laboratory - NATA Site # 18217										
Brisbane Laboratory - NATA Site # 20794										
Perth Laboratory - NATA Site # 23736										
External Laboratory										
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID					
1	BH02-0.6M-0.7M	Jan 23, 2019		Soil	M19-Fe03540	X	X	X	X	X
2	BH05-6.2-6.3M	Jan 23, 2019		Soil	M19-Fe03541	X	X	X	X	X
Test Counts						2	2	2	2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPa, PFHx, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Conductivity (1:5 aqueous extract at 25°C as rec.)			uS/cm	< 10			10	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	M19-Fe02253	NCP	%	107			70-130	Pass	
Sulphate (as SO ₄)	M19-Fe02243	NCP	%	70			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M19-Fe02262	NCP	mg/kg	76	61	23	30%	Pass	
Conductivity (1:5 aqueous extract at 25°C as rec.)	M19-Fe03649	NCP	uS/cm	210	210	<1	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	M19-Fe03649	NCP	pH Units	7.4	7.4	pass	30%	Pass	
Sulphate (as SO ₄)	M19-Fe02242	NCP	mg/kg	44	42	4.0	30%	Pass	
% Moisture	M19-Fe03545	NCP	%	1.9	1.7	10	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised By

Cindi Guo	Analytical Services Manager
Julie Kay	Senior Analyst-Inorganic (VIC)



Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested
* Indicates NATA accreditation does not cover the performance of this service
Measurement uncertainty of test data is available on request or please [click here](#).

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local people
global experience

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