Broad Vision Projects Pty Ltd

GEOTECHNICAL INVESTIGATION

LOT 9501 GAEBLER ROAD HAMMOND PARK

September 2023
10440-G-R-001-1







WML
Consulting Engineers

Document History and Status				
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WML Consultants Pty Ltd

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For and on behalf of WML Consultants Pty Ltd

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1 INTRODUCTION

Broad Vision Projects Pty Ltd (Client) engaged WML Consultants (WML) to undertake a detailed geotechnical investigation for Lot 9501 Gaebler Road, Hammond Park, WA 6164. It is understood that a geotechnical investigation is required to support the design and construction works of the proposed development comprising six individual lots. This report presents the results of the geotechnical investigation, laboratory testing and provides geotechnical recommendations for the proposed development.

This report and the information presented herein must be read in conjunction with the attached "*Report Limitations*".

1.1 Site description

The site is located between Gaebler Road and Hammond Road in Hammond Park, approximately 30 km from Perth CBD, WA, and is bound by residential properties to the east and south, Hammond Primary School to the north, and bushland to the west.

The site is accessible via sandy tracks on the west of Hammond Road and northwest of Gaebler Road. The site is relatively flat, covered with dense vegetation, small to large trees, and branches, and is inaccessible for a vehicle.

It is understood from the client that the proposed site will be subdivided into six lots, with areas ranging between 1,696 m^2 to 23,704 m^2. Based on the supplied site layout plans, the development is to be contained within the western portion of the site on approximately 14,488 m^2, and is proposed to comprise four fast food restaurants, a medical centre, wash bays, a pump room, parking bays, and a fuel canopy, all located within Lots 1 – 5. Lot 6 (23,704 m^2) is located within the eastern portion of the site and is separated from Lots 1 to 5 by a retaining wall, footpath and fire break, and is not proposed to be developed.

1.2 Client supplied information

The following information was made available by the client for the purpose of this report:

- "Overall Site Plan", Drawing Number: 22-9101-SK010, prepared by Meyer Shircore, dated September 2023.

1.3 Objectives of this report

The objectives of the detailed geotechnical investigation were to:

- Assess the sub-surface soil and groundwater conditions across the site
- Provide a site classification for the proposed developments
- Provide site preparation and remediation recommendations
- Provide geotechnical advice for the design

2 FIELD PROGRAMME

2.1 Fieldwork

Fieldwork was carried out on the 30th of June 2022 by WML geotechnical engineers and comprised:

- A site walkover to observe existing site features and to take record photographs.
- Three (3) x solid auger boreholes using a mechanical auger drill rig, extending to depths of 5.2 m, 5.0 m, and 5.0 m below ground level to install groundwater monitoring wells, designated MA1, MA2 amd MA3.
- Five (5) x hand auger boreholes, designated HA4 – HA8, to depths of 1.9 m, 1.6 m, 2.2 m, 2.0 m and 2.1 m, respectively.
- Eight (8) x Perth Sand Penetrometer (PSP) tests and one (1) x Dynamic Cone Penetrometer (DCP) test to determine the characteristics of the material.
- Four (4) x in-situ permeability tests using a Talsma-Hallam Permeameter.

The approximate test locations for the boreholes and hand auger holes were selected in advance of the fieldwork by a qualified geotechnical engineer from WML. The groundwater monitoring well locations were positioned in accordance with the site plan provided by the client prior to the investigation. Each location for intrusive ground investigation was checked for underground services against Dial-Before-You-Dig plans and cleared for any underground services by Advanced Scanning Services before excavation works.

Two WML experienced geotechnical engineers undertook the fieldwork, logged the materials encountered in the boreholes in general accordance with AS 1726:2017 “Geotechnical Site Investigations”. A summary of the fieldwork is provided in Table 1 and the locations of each test conducted are shown in Drawing 10440-G-D-001. The monitoring wells and borehole logs are presented in Appendix A.

Table 1: Summary of fieldwork

Test ID	Coordinates		Termination depth (m)	Reason for termination	Depth to Groundwater (m)	Stratigraphy
	Easting	Northing				
MA1	390932.409	6440282.426	5.2	Target Depth	1.47	**TOPSOIL: SAND (SW)**, over **SAND (SW).**
MA2	390873.751	6440224.864	5.0	Target Depth	2.5	
MA3	390928.876	6440167.252	5.0	Wet Collapse	2.5	
HA4	390922.159	6440248.224	1.9	Target Depth	GNE	
HA5	390950.626	6440258.065	1.6	Target Depth	1.55	
HA6	390925.451	6440188.468	2.2	Target Depth	GNE	
HA7	390908.575	6440249.541	2.0	Target Depth	GNE	
HA8	390889.574	6440184.523	2.1	Target Depth	GNE	

Notes:
All depths are relative to the ground surface at the time of the investigation unless specified otherwise
GNE – Groundwater not encountered

2.2 In-situ permeability tests

Four in-situ permeability tests were undertaken using the constant head Talsma-Hallam method in accordance with AS/NZS 1547:2012. All of the permeability tests consisted of 100mm diameter. They were designated as HA4 650mm deep with pipe 400mm below the ground, HA5 550mm deep with pipe 300mm below the ground, and HA6 and HA7 700mm deep with pipe 450mm below the ground, were excavated and filled with water to saturate the surrounding soil. A constant head of water was then applied, and a known volume of water was timed to dissipate. Table 2 presents the results of the in-situ testing.

Table 2: In-situ permeability test results

Location ID	In-situ Permeability Test	
	m/s	m/day
HA4	1.29E-04	1.11
HA5	1.53E-04	1.32
HA6	2.60E-04	2.25
HA7	1.31E-04	1.13

2.3 Penetrometer Testing

The Dynamic Cone Penetrometer (DCP) test is similar to the PSP, using the same equipment and methodology, however, modified by reducing the drop height (using a spacer) and using a cone-tipped rod. DCP tests are used for soils and materials where PSP testing is not suitable. The number of blows is also correlated to a relative density and is used to describe the condition of the in-situ material. DCP testing is undertaken in accordance with AS1289.6.3.2.

The Perth Sand Penetrometer (PSP) test is an in-situ, manual penetration test that measures the penetration resistance of the soil and provides an indication of the relative density. The test is conducted by driving a flat-tipped rod into the ground surface using a 9kg weight dropped from a standard height. The number of drops (called blows) is recorded for each 150mm depth, and the process continues till the target depth is achieved. PSP testing in accordance with AS 1289.6.3.3.

Eight (8) PSP tests were conducted on-site adjacent to each hand-augured and mechanically augured borehole with one (1) DCP test conducted at HA8. A target depth of 1.05 m was achieved for all tests, with final HA8 testing depths 2.10 m below ground level. Results are presented below in Table 3 and also included in the soil logs attached in Appendix A.

Table 3: Summary of PSP/DCP testing

Depth		Test Location								
Penetration Top (m bgl)	Penetration Bottom (m bgl)	MA1 – PSP1	MA2 – PSP2	MA3 – PSP3	HA4 – PSP4	HA5 – PSP5	HA6 – PSP5	HA7 – PSP6	HA8 – PSP7	HA8 – DCP1
0.00	0.15	2	1	1	0	0	1	1	0	0
0.15	0.30	9	2	2	1	1	1	1	1	1
0.30	0.45	12	3	2	2	2	2	1	2	1
0.45	0.60	12	5	2	3	2	2	1	2	2
0.60	0.75	10	6	4	4	3	4	3	3	4
0.75	0.90	8	5	4	4	5	3	3	4	3
0.90	1.05	7	3	4	5	6	4	3	5	5

1.05	1.20	–	–	–	–	–	–	–	5	5
1.20	1.35	–	–	–	–	–	–	–	6	8
1.35	1.50	–	–	–	–	–	–	–	8	9
1.50	1.65	–	–	–	–	–	–	–	8	8
1.65	1.80	–	–	–	–	–	–	–	9	9
1.80	1.95	–	–	–	–	–	–	–	9	10
1.95	2.10	–	–	–	–	–	–	–	8	7

3 LABORATORY TESTING

To provide confirmation of the classification of the soils and assist in the evaluation of suitable geotechnical design parameters for the encountered sub-surface profile, laboratory testing was carried out by NATA accredited laboratory Western Geotechnical. The testing comprised the following:

- Particle size distribution (PSD) on 1 sample (AS 1289 3.6.1)

Table 4 presents the summary of the laboratory test results and the laboratory certificates are in Appendix B.

Table 4: Summary of soil classification testing

Test ID	Depth (m)	PSD		
		Fines (%)	Sand (%)	Gravel (%)
BH1	1.2 – 1.8	2	97	1

4 SUBSURFACE CONDITIONS

4.1 Published geology

The 1:50,000 scale Geological Map 'Fremantle' indicates that the site is underlain by the following geological unit:

- SAND – very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted, of Eolian origin.

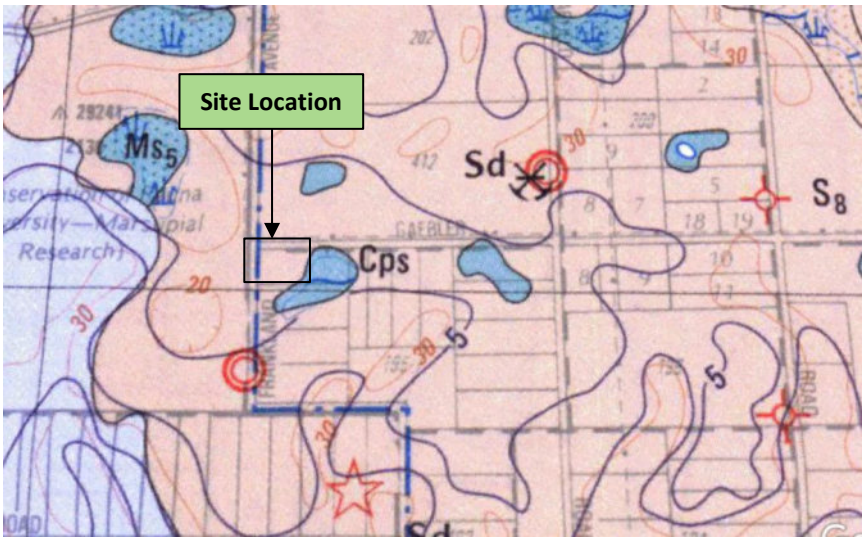


Figure 1: Extract from the 1:50,000 scale Geological Map " Fremantle"

4.2 Groundwater

Groundwater was encountered in all three (3) monitoring wells, MA1, MA2 and MA3 that were installed at the end of June 2022. Groundwater was also found at HA2 at depths of 1.55 m below ground level. The monitoring wells should be regularly checked (every four weeks) throughout the winter season to obtain an accurate groundwater level. According to the Perth Groundwater Map, groundwater for the area is located approximately 5.0 m below ground level. A summary of the groundwater levels recorded at the site 28th of June 2022 is presented below in Table 5.

Table 5: Measured groundwater levels

Location ID	Depth Below Ground (m)
MA1	1.47
MA2	2.50
MA3	2.50
HA8	1.55

Notes: All depths are relative to the existing ground surface

4.3 Interpreted subsurface profile

Table 6: Sub-surface soil profile

Depth (m)	Description
0.0 – 0.30	**TOPSOIL: SAND (SW)**, fine to medium grained, dark grey; trace silt; moist; very loose.
0.3 – 5.2	**SAND (SW)**, medium to coarse-grained, subrounded to subangular, dark/pale cream, dark grey, trace silt; moist; medium dense.

5 FINDINGS & RECOMMENDATION

5.1 Suitability for development

Based on the investigation results, the site is considered suitable for development after the remediation of the near surface topsoil sands are removed.

5.2 Site classification

Based upon the site investigation results, the site may be classified in accordance with AS 2870:2011 - "Residential Slabs and Footings" which requires an estimation of the expected surface movement due to the wetting and drying of a foundation.

The natural soils encountered during the site investigation have been described as TOPSOIL: SAND, overlaying SAND in accordance with the soil logging guidance included in AS 1726:2017. The site in its current conditions may be classified as an **"Class A"** in accordance with AS 2870:2011, provided the site preparation recommendations are adhered to in Section 4.3 below.

CLASSIFICATION BY CHARACTERISTIC SURFACE MOVEMENT (y_s)

Characteristic surface movement (y_s) mm	Site classification in accordance with Table 2.1
$0 < y_s \leq 20$	S
$20 < y_s \leq 40$	M
$40 < y_s \leq 60$	H1
$60 < y_s \leq 75$	H2
$y_s > 75$	E

Figure 2: Extract from AS2870:2011 (Table 2.3)

Sites with inadequate bearing strength or where ground movement may be significantly affected by factors other than reactive soil movements due to normal moisture conditions shall be classified as Class P. Class P sites include: the site contains uncontrolled or controlled fill as identified in AS 2870 Clause 2.5.3, soft or unstable foundations such as soft clay or silt or loose sands, landslip, mine subsidence, collapsing soils and soils subject to erosion, reactive sites subject to abnormal moisture conditions and sites that cannot be classified in accordance with AS 2870 Clause 2.1.2.

5.3 Geotechnical design parameters

Based on the observations made in the field, Table 7 below presents the geotechnical parameters for the soil profile referenced in Section 3.3.

Table 7: Geotechnical design parameters

Parameter	Values
Φ (Internal friction)	33
Cu (Cohesion)	0
E (Youngs Modulus)	30 MPa
Passive Earth Pressure	3.537
Active Earth Pressure	0.283
γ (Unit Weight)	18 kN/m3
K (Design permeability)	1.11 m/day
California Bearing Ratio (CBR %)	10

Notes:

Field observations and in-situ tests (PSP and permeameter)

Passive and Active earth pressures based on Coulomb's theory with no backfill angle, wall fgriction and for cohesionless soils.

[1]Short-term and Long-Term Youngs modulus derived from Industrial Pavement Design Guide (cl.3.3.7.2).

5.4 Footings

WML have undertaken bearing capacity analysis utilizing the latest GEO5 spread footing software for a range of footing sizes for the sub-surface profiles. Table 8 below presents the allowable bearing capacity and expected limited foundation settlement based on the embedment wall at a depth of 0.3 m.

- The footings will be supported on the existing fill material following the topsoil strip to be compacted to a minimum DDR of 95 % MMDD as detailed in section 4.3.
- A geotechnical strength reduction factor of 0.35 was used in the analysis in accordance with Tables 5.3.3.3 (A) and 5.3.3.3 (B) of AS 5100.3 (2017).
- The Hansen (1961) bearing capacity method was used.

Table 8: Allowable bearing capacity

Embedment Size (m)	Footing Size (m)	Allowable bearing capacity (kPa)	Foundation settlement (mm)
0.3	1 x 1	150	< 10

5.5 Seismic hazards

Based on the identified soil profile and a review of the available geotechnical data, the site may generally be classified as '**Class Ce: Shallow soil site**'. As the soils and depth to rock can be considered within the limits outlined in AS/NZS 1170.4 Table 4.1. Additionally, based on the site location, a hazard factor (Z) of 0.09 shall be applied.

5.6 Site preparation and remediation

The following items should be considered when designing the earthwork levels and tendering the construction:

- Remove trees, vegetation and topsoil (approximately 300 mm) from the construction area, including grubbing out of all roots and stumps; topsoil can be stockpiled for future reuse for landscaping or disposed. The topsoil materials should not be used for structural purposes.
- A qualified geotechnical engineer should inspect the subgrade to ensure that adequate removal of topsoil has been completed.
- Strip off 600 mm of 'won' sands from the construction area and store in the appropriate area. Ensure all of the sands are clear of any tree roots, stumps and fines less than 5%.
- Proof-compaction of the exposed subgrade should be undertaken to identify any loose/soft areas.
    - Each area should be given 8 – 10 passes with a minimum 10 ton vibratory roller or equivalent to achieve the compaction specification outlined below.
    - Any loose/soft areas identified should be removed and replaced with clean well graded sand fill.
- The site 'won' stockpile sand can be reused or If any imported fill material used should be free draining sand or granular material with a fines (<75 micron) and organic content no greater than 5% and 2%, respectively.
- Any fill material placed should be compacted in lifts no greater than 300 mm at a time. Care should be given to adjacent structures during vibratory compaction. It may be necessary to forego vibration and continue only with static rolling.
- Compaction works should be tested to a minimum depth of 950 mm to ensure the minimum required compaction ratio has been achieved. Compaction compliance in clean sands can be assessed using a Perth Sand Penetrometer (PSP) test. Typically, the blows per 300 mm, as detailed Table 9 below, represent 95% MMDD compaction for clean sands. These blow counts should be considered a minimum amount required regardless of other indicators. If a calibrated PSP test indicates a higher blow count is required, those blow counts should be adopted.
- Following confirmation of compaction compliance of the subgrade, clean sand fill free of deleterious material should be placed up to design levels.

- Construct footings in accordance with structural engineer's design.
- For the areas with structural footing areas it is recommended to moisture condition (if required) and proof-compact the exposed subgrade in the presence of an experienced geotechnical engineer and compact the subgrade to a dry density ratio of 95% MMDD.

Table 9:Typical PSP blow counts to achieve 95% MMDD

Testing depth (mm)	Blow counts per 300 mm
150 – 450	8
450 – 750	10
750 – 950	12
Each subsequent 300 mm	12+

5.7 Further studies

- WML recommends additional geotechnical investigation is required in the areas of building if deep foundations are needed that were inaccessible with a solid auger drill rig before remediation to provide an accurate geotechnical model.

6 CLOSURE

WML did not encounter any environmental contamination or evidence of previous man-made buried structures during the site investigation, however this does not indicate that they do not exist. Attention should be taken during any excavation works, and if any, contamination, unknown buried structures or unexpected ground conditions are encountered, WML should be contacted immediately.

We trust that the information provided within this report satisfies your present requirements and meets with your approval. Should you have any queries, please do not hesitate to contact the author of this report.

We draw your attention to the attached "*Report Limitations*" included with this report. This information sheet is intended to provide additional information about this report and information included within it. This information is provided not to reduce the level of responsibility accepted by WML but to ensure that all parties that rely on this report, and the information contained herein, are aware of the responsibilities that each assumes in so doing.

7 REFERENCES

1. Geological Series Map 1:50,000 Scale 'Fremantle'
2. Standards Australia/New Zealand. 2002. *Structural Design Actions Part 1: Permanent, imposed, and other actions*. AS 1170.1:2002. SAI Global.
3. Standards Australia/New Zealand. 2007. *Structural Design Actions Part 4: Earthquake Actions in Australia*. AS 1170.4:2007. SAI Global.
4. Standards Australia. 2017. *Geotechnical Site Investigations*. AS 1726:2017. SAI Global.
5. Standards Australia. 2011. *Residential Slabs and Footings*. AS 2870:2011. SAI Global.
6. Standards Australia. 2007. Earthworks for Residential and Commercial Developments. AS 3798:2007. SAI Global.
7. Standards Australia. 2007. Earth Retaining Structures. AS 4678:2002. SAI Global.

LIMITATIONS

REPORT LIMITATIONS

WML have undertaken investigations, performed consulting services, and prepared this report based on the Client's specific requirements, documents and information supplied, and previous experience. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the Client to transmit the information and recommendations of this report to the appropriate organisations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers.

We performed our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty, expressed or implied, is made as to the professional advice included in this report.

Any data provided by third parties including, but not limited to: sub-consultants, published data, and the Client, may not be verified and WML assumes no responsibility for the adequacy, incompleteness, inaccuracies, or reliability of this information. WML does not assume any responsibility for assessments made partly or entirely based on information provided by third parties.

This report has been prepared based on investigation locations which are explicitly representative of the specific sample or test points. Interpretation of conditions between such points cannot be assumed to represent actual subsurface information and there are unknowns or variations in ground conditions between test locations that cannot be inferred or predicted.

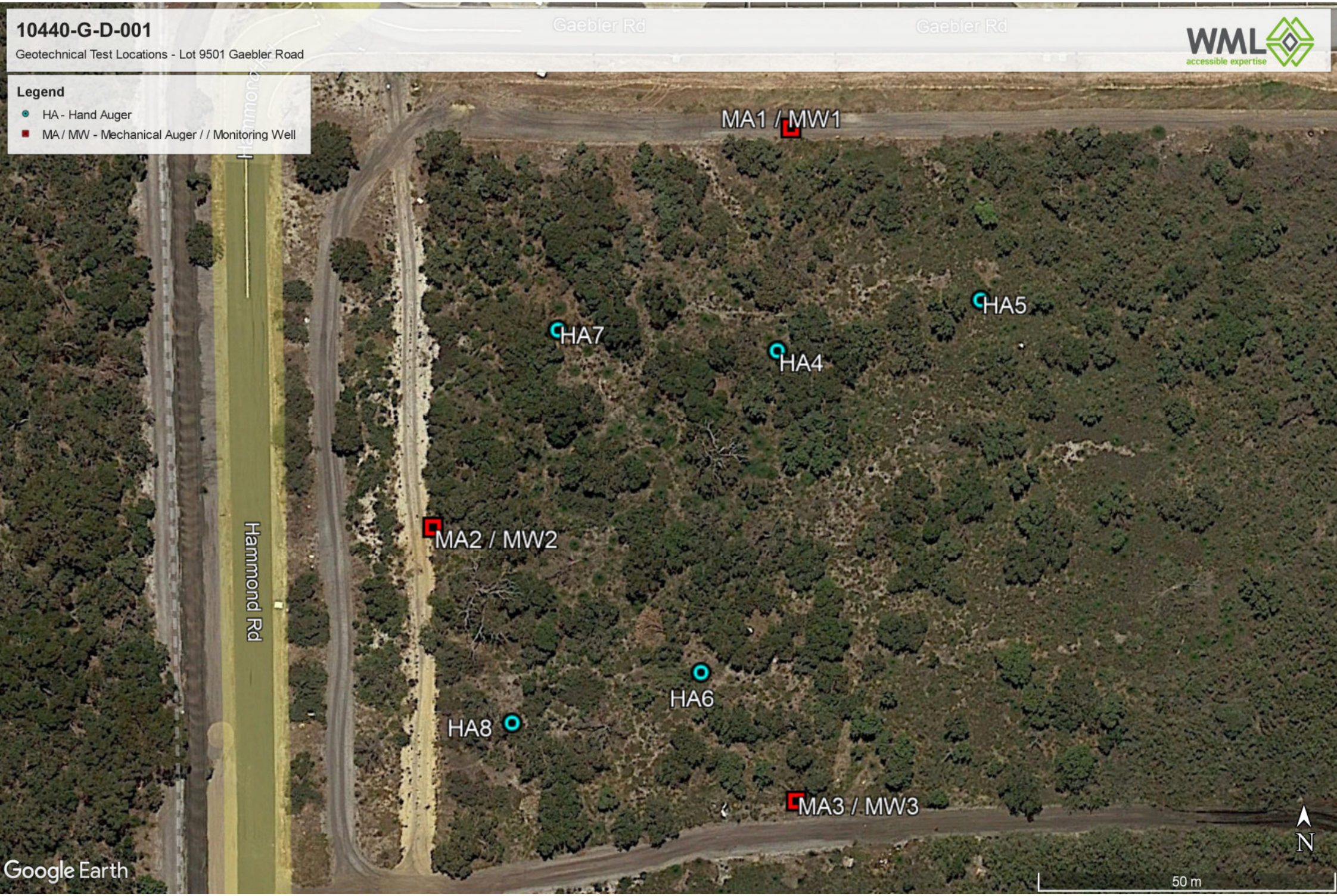
This report is based upon field and other conditions encountered at the time of report preparation. If unexpected subsurface conditions are encountered, WML shall be notified immediately to review those conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include any contamination or environmental assessment of the site or adjacent sites. The nature of geotechnical investigation differs from the environmental investigation practice. If you require any environmental considerations to be applied to your project, WML can advise on further steps to be undertaken.

Geotechnical assessments are typically based on judgment of the investigation data and visual observations of the site and materials.

This document must not be subject to unauthorised use that is, reusing without written authorisation of WML. Such authorisation is essential because it requires WML to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

DRAWINGS


10440-G-D-001
Geotechnical Test Locations - Lot 9501 Gaebler Road
WML
accessible expertise
Legend
HA - Hand Auger
MA / MW - Mechanical Auger / / Monitoring Well
Gaebler Rd
Gaebler Rd
Hammond Rd
MA1 / MW1
HA5
HA7
HA4
MA2 / MW2
HA6
HA8
MA3 / MW3
N
Google Earth
50 m



SITE CRITERIA

LOT 1

1. Site Area		**2,378m²**
2. Landscaping		
a. Required Soft L/S	**10% Of Site**	**238m²**
OR	**5% + Verge**	**119m²**
b. Provided		
i. Soft		267m²
ii. Hard		85m²
	Total	**352m²**
3. Floor Area (GFA)		
a. Convenience Store		**192m²**
4. Carparking		**Carbays**
a. Cars Required	192m² @ 1/15m²	13
	1 Per Employee	2
	Total	**15**
b. Cars Provided		
i. On Grade		9
ii. Fuel Canopy		8
	Total	**17**

LOT 2

1. Site Area		**1,696m²**
2. Landscaping		
a. Required Soft L/S	**10% Of Site**	**170m²**
OR	**5% + Verge**	**85m²**
b. Provided		
i. Soft		222m²
ii. Hard		195m²
	Total	**417m²**
3. Floor Area (GFA)		
a. Fast Food		**245m²**
4. Carparking		**Carbays**
a. Cars Required	245m² @ 1/15m²	**17**
b. Cars Provided		
i. On Grade		14
ii. Drive Thru'		10
	Total	**24**

LOT 3

1. Site Area		**3,259m²**
2. Landscaping		
a. Required Soft L/S	**10% Of Site**	**326m²**
OR	**5% + Verge**	**163m²**
b. Provided		
i. Soft		532m²
ii. Hard		354m²
	Total	**886m²**
3. Floor Area (GFA)		
a. Medical Centre		**640m²**
4. Carparking		**Carbays**
a. Cars Required	10 Practitioner @ 5 Per	**50**
b. Cars Provided		
i. On Grade		**45**

LOT 4

1. Site Area		**2,702m²**
2. Landscaping		
a. Required Soft L/S	**10% Of Site**	**270m²**
OR	**5% + Verge**	**135m²**
b. Provided		
i. Soft		302m²
ii. Hard		166m²
	Total	**468m²**
3. Floor Area (GFA)		
a. Fast Food		**450m²**
4. Carparking		**Carbays**
a. Cars Required	450m² @ 1/15m²	**30**
b. Cars Provided		
i. On Grade		25
ii. Drive Thru'		12
	Total	**37**

LOT 5

1. Site Area		**4,453m²**
2. Landscaping		
a. Required Soft L/S	**10% Of Site**	**445m²**
OR	**5% + Verge**	**223m²**
b. Provided		
i. Soft		674m²
ii. Hard		227m²
	Total	**901m²**
3. Floor Area (GFA)		
a. Fast Food		**270m²**
4. Carparking		**Carbays**
a. Cars Required	270m² @ 1/15m²	**18**
b. Cars Provided		
i. On Grade		25
ii. Drive Thru'		10
	Total	**35**

Landscaping
A. Hard Landscaping
Defined as paved walkways either open or covered.
B. Soft Landscaping
Defined as vegetative landscaping.

Gross Floor Area - GFA
A. All Floor Areas on this plan are shown as GROSS FLOOR AREA.
Unless otherwise noted as Nett Floor Area
B. Definition of Gross Floor Area is defined as:
i/ GROSS FLOOR AREA OF TENANCY:
Gross Floor Area of an individual Tenancy is defined as the area contained between the centre line of common tenancy walls and the outside edge of external walls.
iii/ GROSS FLOOR AREA OF A BUILDING:
Gross Floor Area of a Building is defined as the total area contained between the outside edge of external walls

COMPOSITE SITE CRITERIA

1. Site Area		
a. Lot 1		2,378m²
b. Lot 2		1,696m²
c. Lot 3		3,259m²
d. Lot 4		2,702m²
e. Lot 5		4,453m²
	Total	**14,488m²**
2. Landscaping		
a. Provided		
i.Soft		1,821m²
ii. Hard		1,202m²
	Total	**3,023m²**
3. Floor Area (GFA)		
a. Convenience Store		192m²
b. Food Restuarant		965m²
c. Medical Centre		640m²
	Total	**1,797m²**
4. Carparking		
a. Required		**Carbays**
Convenience Store	192m² @ 1/15m²	13
	1 Per Employee	2
Food Restuarant	965m² @ 1/15m²	65
Medical Centre	10 Prac @ 5 Per	50
	Total	**130**
b. Cars Provided		
i. On Grade		118
ii. Drive Thru'		32
iii. Fuel Canopy		8
	Total	**158**

SITE PLAN
SCALE: 1 : 500

PROPOSED MIXED USE DEVELOPMENT
LOCATION : LOT 9501 CNR GAEBLER ROAD & HAMMOND ROAD, HAMMOND PARK
FOR : BROAD VISION PROJECTS

meyer shircore architects

Member Australian Institute of Architects

0 5 10 15 20 25 50

DATE: SEP 2023
REVISION: SK010
SHEET: 4
SCALE: 1 : 500 @B1

PROJECT NUMBER **22-9101**

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APPENDIX A

BOREHOLE LOGS

HAND AUGER: HA4

SHEET: 1 OF 1

CLIENT: Broad Vision Projects Pty Ltd
PROJECT: Lot 9501 Gaebler Road Gl
JOB NO.: 10440
LOCATION: Hammond Park

HOLE DEPTH: 1.90m
COORDINATES: 390922.2 m E, 6440248.2 m N, MGA94 Zone 51
INCLINATION: -90°

CONTRACTOR: WML Consultants
EQUIPMENT: Hand-Auger
LOGGED: KC
CHECKED: PT
START DATE: 30/6/2022
END DATE: 30/6/2022

Drilling				Field Material Description					IN SITU TESTING	SAMPLE	PERTH PENETROMETER TEST Blows per 150 mm
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY			5 10 15 20 25 30 35 40
		0.0			SP	**TOPSOIL; SAND,** fine to coarse grained, subrounded to subangular, dark grey; trace root fibre; moist; loose.	M	L			
		0.2	0.30		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale cream; trace root fibre; moist; medium dense.	M	MD			
	Not Encountered	0.4									
		0.6									
		0.8									
		1.0									
		1.2									
		1.4									
		1.6									
		1.8	1.90								
		2.0				Hole Terminated at 1.90 m Refusal					

WML 2.01.4 LIB:GLB Log WML BOREHOLE LOG 10440 LOGS.GPJ <<DrawingFile>> 22/7/2022 16:53 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WML 2.01.4 2022-03-25 Prj: WML 2.01.4 2022-03-25

HAND AUGER: HA5

SHEET: 1 OF 1

CLIENT:	Broad Vision Projects Pty Ltd	HOLE DEPTH:	1.60m	CONTRACTOR:	WML Consultants
PROJECT:	Lot 9501 Gaebler Road Gl	COORDINATES:	390950.6 m E, 6440258.1 m N, MGA94 Zone 51	EQUIPMENT:	Hand-Auger
JOB NO.:	10440			LOGGED:	KC
LOCATION:	Hammond Park	INCLINATION:	-90°	CHECKED:	PT

START DATE: 30/6/2022

END DATE: 30/6/2022

Drilling				Field Material Description							
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	IN SITU TESTING	SAMPLE	PERTH PENETROMETER TEST Blows per 150 mm
		0.0			SP	**TOPSOIL; SAND,** fine to coarse grained, subrounded to subangular, dark grey; trace root fibre; moist; very loose.	M	VL			
		0.2	0.30		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale grey; trace root fibre; moist; loose.	M	L			
	1.47	0.4									
		0.6									
		0.8	0.80		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale cream; trace root fibre; wet; medium dense.	W	MD			
		1.0									
		1.2									
		1.4									
	1.55m	1.6	1.60			Hole Terminated at 1.60 m Refusal					

5 10 15 20 25 30 35 40

WML 2.01.4 LIB.GLB Log WML BOREHOLE LOG 10440 LOGS.GPJ <<DrawingFile>> 22/7/2022 16:53 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WML 2.01.4 2022-03-25 Prj: WML 2.01.4 2022-03-25

HAND AUGER: HA6

SHEET: 1 OF 1

CLIENT:	Broad Vision Projects Pty Ltd	HOLE DEPTH:	2.20m	CONTRACTOR:	WML Consultants
PROJECT:	Lot 9501 Gaebler Road Gl	COORDINATES:	390925.5 m E, 6440188.5 m N, MGA94 Zone 51	EQUIPMENT:	Hand-Auger
JOB NO.:	10440			LOGGED:	KC
LOCATION:	Hammond Park	INCLINATION:	-90°	CHECKED:	PT

START DATE: 30/6/2022

END DATE: 30/6/2022

Drilling				Field Material Description					IN SITU TESTING	SAMPLE	PERTH PENETROMETER TEST Blows per 150 mm
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY			5 10 15 20 25 30 35 40
	Not Encountered	0.0			SP	**TOPSOIL; SAND,** fine to coarse grained, subrounded to subangular, dark grey; trace root fibre, trace silt; moist; very loose.	M	VL			
		0.2	0.30		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale grey; trace silt; moist; loose.	M	L			
		0.6	0.70		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale cream; trace silt; moist; medium dense.	M	MD			
		2.2	2.20			Hole Terminated at 2.20 m Target depth					

WML 2.01.4 LIB.GLB Log WML BOREHOLE LOG 10440 LOGS.GPJ <<DrawingFile>> 22/7/2022 16:54 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WML 2.01.4 2022-03-25 Prj: WML 2.01.4 2022-03-25

HAND AUGER: HA7

SHEET: 1 OF 1

CLIENT:	Broad Vision Projects Pty Ltd	HOLE DEPTH:	2.00m	CONTRACTOR:	WML Consultants
PROJECT:	Lot 9501 Gaebler Road Gl	COORDINATES:	390908.6 m E, 6440249.5 m N, MGA94 Zone 51	EQUIPMENT:	Hand-Auger
JOB NO.:	10440			LOGGED:	KC
LOCATION:	Hammond Park	INCLINATION:	-90°	CHECKED:	PT

START DATE: 30/6/2022

END DATE: 30/6/2022

Drilling				Field Material Description					IN SITU TESTING	SAMPLE	PERTH PENETROMETER TEST Blows per 150 mm
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY			5 10 15 20 25 30 35 40
		0.0			SP	**TOPSOIL; SAND,** fine to coarse grained, subrounded to subangular, dark grey; trace root fibre; moist; very loose.	M	VL			
		0.2	0.30		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale grey; trace root fibre; moist; medium dense.	M	MD			
		0.4									
		0.6									
		0.8	0.80		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale cream; trace root fibre; moist; medium dense.	M	MD			
	Not Encountered	1.0									
		1.2									
		1.4									
		1.6									
		1.8									
		2.0	2.00			Hole Terminated at 2.00 m Target depth					
		2.2									

WML 2.01.4 LIB.GLB Log WML BOREHOLE LOG 10440 LOGS.GPJ <<DrawingFile>> 22/7/2022 16:54 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WML 2.01.4 2022-03-25 Prj: WML 2.01.4 2022-03-25

HAND AUGER: HA8

SHEET: 1 OF 1

CLIENT:	Broad Vision Projects Pty Ltd	HOLE DEPTH:	2.10m	CONTRACTOR:	WML Consultants
PROJECT:	Lot 9501 Gaebler Road Gl	COORDINATES:	390889.6 m E, 6440184.5 m N, MGA94 Zone 51	EQUIPMENT:	Hand-Auger
JOB NO.:	10440			LOGGED:	KC
LOCATION:	Hammond Park	INCLINATION:	-90°	CHECKED:	PT

START DATE: 30/6/2022

END DATE: 30/6/2022

Drilling				Field Material Description					IN SITU TESTING	SAMPLE	DCP TEST Blows per 150 mm
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY			5 10 15 20 25 30 35 40
	Not Encountered	0.0			SP	**TOPSOIL; SAND,** fine to medium grained, pale grey; trace root fibre, trace organics; moist; loose.	M	L			
		0.2	0.30		SP	**TOPSOIL; SAND,** fine to coarse grained, subrounded to subangular, pale cream; trace root fibre, trace organics; wet; dense.	W	D			
		0.4									
		0.6									
		0.8									
		1.0									
		1.2									
		1.4									
		1.6									
		1.8									
		2.0	2.10								
		2.2				Hole Terminated at 2.10 m Target depth					

WML 2.01.4 LIB:GLB Log WML BOREHOLE LOG 10440 LOGS.GPJ <<DrawingFile>> 22/7/2022 16:54 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WML 2.01.4 2022-03-25 Prj: WML 2.01.4 2022-03-25

HAND AUGER: HA8

SHEET: 1 OF 1

CLIENT:	Broad Vision Projects Pty Ltd	HOLE DEPTH:	2.10m	CONTRACTOR:	WML Consultants
PROJECT:	Lot 9501 Gaebler Road Gl	COORDINATES:	390889.6 m E, 6440184.5 m N, MGA94 Zone 51	EQUIPMENT:	Hand-Auger
JOB NO.:	10440			LOGGED:	KC
LOCATION:	Hammond Park	INCLINATION:	-90°	CHECKED:	PT

START DATE: 30/6/2022

END DATE: 30/6/2022

Drilling				Field Material Description					IN SITU TESTING	SAMPLE	DCP TEST Blows per 150 mm
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY			5 10 15 20 25 30 35 40
		0.0			SP	**TOPSOIL; SAND,** fine to medium grained, pale grey; trace root fibre, trace organics; moist; loose.	M	L			
		0.2	0.30		SP	**TOPSOIL; SAND,** fine to coarse grained, subrounded to subangular, pale cream; trace root fibre, trace organics; wet; dense.	W	D			
	Not Encountered	0.4									
		0.6									
		0.8									
		1.0									
		1.2									
		1.4									
		1.6									
		1.8									
		2.0	2.10								
		2.2				Hole Terminated at 2.10 m Target depth					

WML 2.01.4 LIB.GLB Log WML BOREHOLE LOG 10440 LOGS.GPJ <<DrawingFile>> 22/7/2022 16:55 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WML 2.01.4 2022-03-25 Prj: WML 2.01.4 2022-03-25

MONITORING WELL: MA1

SHEET: 1 OF 1

CLIENT: Broad Vision Projects Pty Ltd
PROJECT: Lot 9501 Gaebler Road Gl
JOB NO.: 10440
LOCATION: Hammond Park

HOLE DEPTH: 5.20m
COORDINATES: 390932.4 m E, 6440282.4 m N, MGA94 Zone 51
INCLINATION: -90°

CONTRACTOR: WML Consultants
EQUIPMENT: Drill Rig
LOGGED: KC
CHECKED: PT
START DATE: 30/6/2022
END DATE: 30/6/2022

Drilling				Field Material Description					IN SITU TESTING	SAMPLE	DCP TEST Blows per 150 mm
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY			5 10 15 20 25 30 35 40
		0.0			SP	**TOPSOIL; SAND,** fine to medium grained, dark grey; trace silt; moist; dense.	M	D			
			0.30		SP	**SAND,** fine to coarse grained, subrounded to subangular, dark cream; trace silt; moist; medium dense.	M	MD			
		0.5									
		1.0									
	1.466m	1.5	1.50		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale grey; trace silt; moist; medium dense.	M	MD			
			1.80		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale cream; trace silt; wet; medium dense.	W	MD			
	1.47	2.0									
		2.5									
		3.0									
		3.5	3.60		SP	**SAND,** fine to coarse grained, subrounded to subangular, dark grey; trace silt; wet; dense.	W	D			
			3.90		SP	**SAND,** fine to coarse grained, subrounded to subangular, dark grey; trace silt; wet; dense.	W	D			
		4.0									
		4.5									
		5.0	5.20			Hole Terminated at 5.20 m Target Depth; Monitoring well installed to 2.35 m with 0.65m stickup. Gravel response zone between 0.4 m and 2.35 m.					
		5.5									

WML 2.01.4 LIB.GLB Log WML BOREHOLE LOG 10440 LOGS.GPJ <<DrawingFile>> 22/7/2022 16:54 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WML 2.01.4 2022-03-25 Prj: WML 2.01.4 2022-03-25

MONITORING WELL: MA2

SHEET: 1 OF 1

CLIENT:	Broad Vision Projects Pty Ltd	HOLE DEPTH:	5.00m	CONTRACTOR:	WML Consultants
PROJECT:	Lot 9501 Gaebler Road Gl	COORDINATES:	390873.8 m E, 6440224.9 m N, MGA94 Zone 51	EQUIPMENT:	Drill Rig
JOB NO.:	10440			LOGGED:	KC
LOCATION:	Hammond Park	INCLINATION:	-90°	CHECKED:	PT

START DATE: 30/6/2022

END DATE: 30/6/2022

Drilling				Field Material Description							
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	IN SITU TESTING	SAMPLE	PERTH PENETROMETER TEST Blows per 150 mm
		0.0			SP	**TOPSOIL; SAND,** fine to coarse grained, subrounded to subangular, dark grey; trace root fibre; moist; loose.	M	L			
			0.30		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale cream; moist; medium dense.	M	MD			
		1.0	1.20		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale brown; moist; medium dense.	M	MD			
	2.5m Bd	2.5									
		3.5	3.60		SP	**SAND,** fine to coarse grained, subrounded to subangular, dark grey; wet; medium dense.	W	MD			
		5.0	5.00			Hole Terminated at 5.00 m Target Depth; Monitoring well installed to 3.1 m with 1m stickup. Gravel response zone between 0.4 m and 3.1 m.					

WML 2.01.4 LIB:GLB Log WML BOREHOLE LOG 10440 LOGS.GPJ <<DrawingFile>> 22/7/2022 16:54 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WML 2.01.4 2022-03-25 Prj: WML 2.01.4 2022-03-25

MONITORING WELL: MA3

SHEET: 1 OF 1

CLIENT: Broad Vision Projects Pty Ltd
PROJECT: Lot 9501 Gaebler Road Gl
JOB NO.: 10440
LOCATION: Hammond Park

HOLE DEPTH: 5.00m
COORDINATES: 390928.9 m E, 6440167.3 m N, MGA94 Zone 51
INCLINATION: -90°

CONTRACTOR: WML Consultants
EQUIPMENT: Drill Rig
LOGGED: KC
CHECKED: PT
START DATE: 30/6/2022
END DATE: 30/6/2022

Drilling				Field Material Description					IN SITU TESTING	SAMPLE	PERTH PENETROMETER TEST Blows per 150 mm
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY			5 10 15 20 25 30 35 40
		0.0			SP	**TOPSOIL; SAND,** fine to coarse grained, subrounded to subangular, dark grey; trace root fibre, trace organics; moist; loose.	M	L			
			0.30		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale grey; trace silt; moist; medium dense.	M	MD			
		0.5									
			1.00		SP	**SAND,** fine to coarse grained, subrounded to subangular, pale cream; trace silt; moist; medium dense.					
		1.0									
		1.5									
		2.0									
	2.5m ▽	2.5									
		3.0					M	MD			
		3.5									
		4.0									
		4.5									
			5.00								
		5.0				Hole Terminated at 5.00 m Target Depth; Monitoring well installed to 2.11 m with 0.98 m stickup. Gravel response zone between 0.4 m and 2.11 m.					
		5.5									

WML 2.01.4 LIB:GLB Log WML BOREHOLE LOG 10440 LOGS.GPJ <<DrawingFile>> 22/7/2022 16:54 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WML 2.01.4 2022-03-25 Prj: WML 2.01.4 2022-03-25

APPENDIX B

LABORATORY TESTING

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

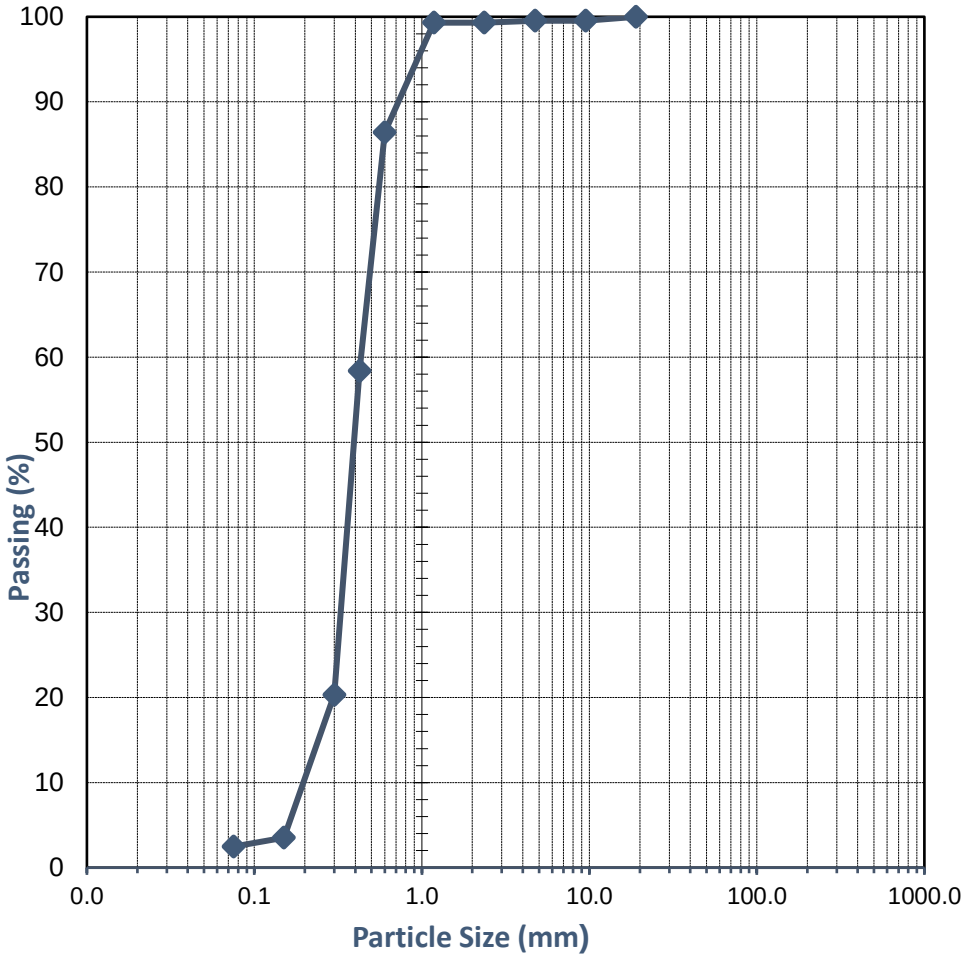
TEST REPORT - AS 1289.3.6.1

Client:	WML Consultants	*Ticket No.*	S6811
Client Address:	Level 3/1 Prowse St, West Perth WA 6005	*Report No.*	WG22.11002_1_PSD
Project:	Lot 9501 Gaebler Road Geotechnical InvestigationS	*Sample No.*	WG22.11002
Location:	Hammond Park	*Date Sampled:*	30-06-2022
Sample Identification:	BH1 (1.2 - 1.8)	*Date Tested:*	13/07 - 14/07/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	100
9.5	100
4.75	100
2.36	99
1.18	99
0.600	86
0.425	58
0.300	20
0.150	4
0.075	2



Comments:

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

Date: 14-July-2022

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

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APPENDIX C

PHOTOGRAPHS

PHOTOGRAPHIC RECORD

Client:	Broad Vision Projects Pty Ltd
Job Number:	10440
Job Description:	Lot 9501 Gaebler Road Hammond Park



Photo 1: Spoil material for HA7



Photo 2: HA7 Surrounding Area