

# CONTAMINATED SITE VALIDATION REPORT

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**Lots 14 and 15 Section L DP 8993**  
**No. 7 James Street**  
**Argenton**

for  
**Alesco Senior College**

Ref: 2020233.02 – VAL  
24 June 2020

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## ATTACHMENTS

1. Photographs 1 – 3
2. Drawing 2020233-SIT-01
3. Laboratory Results
4. General Notes

## 1. INTRODUCTION

At your request Agility Engineering have carried out a Contaminated Site Validation at Lots 14 and 15 Section L DP 8993, No. 7 James Street, Argenton.

The purpose of this investigation was to:

- Provide validation that the site was remediated in accordance with the remedial action plan (RAP) prepared for the site; and
- Provide a clear statement that the site is considered suitable for the proposed use as a senior college.

This report should be read in conjunction with the attached "General Notes".

## 2. SITE DESCRIPTION AND DETAILS

The site supports an approximate 400m<sup>2</sup> metal roofed and brick veneer building located in the north western portion of the site. The brick building was previously used as a gym and recreational office space. The south eastern portion of the site was paved with asphalt hardstand and used as a carpark.

Additional site details are shown in Table 1.

Table 1 – Additional Site Details

Site Detail	Description
<b>Lot and DP</b>	Lots 14 and 15 Section L DP 8993
<b>Zoning</b>	R2 – Low density residential Identified as being within a "Lead Contamination Notification Area" (possible lead contamination).
<b>Approximate size of site:</b>	1500m <sup>2</sup>
<b>Land use:</b>	
<b>Current:</b>	Site currently un-occupied. Previously used as a gym and recreational office area.
<b>Proposed:</b>	Secondary School Education Centre. It was proposed that the existing building and carpark hardstand remain intact and it is proposed that the open areas northeast/east and southwest/west of the existing building be replaced with hardstand.

<b>Surrounds:</b>	James Street and a railway line to the south/southeast and low density residential on the remaining sides.
<b>Closest Environmental Receptor</b>	Cockle Creek (approximately 680m to the West of the site).
<b>Closest Human Health Receptor</b>	Surrounded by residential development and Argenton Public School approximately 150m to the West of the site.

Topographically, the site was generally flat with a gentle slope from east to west of between 1 - 2°.

The site has been identified to be within an area of 'lead fallout' originating from the pre-existing Pasminco lead and zinc smelter (Pasminco). The boundary of Pasminco was located approximately 75m to the southeast of the site. During Pasminco's operation, lead fines were emitted into the atmosphere and settled on the surrounding suburbs. This is commonly described as the Pasminco 'lead fallout'. Additionally, waste ore material (slag) produced by Pasminco's operations was commonly used for building and construction purposes across the Lake Macquarie region.

### 3. SUMMARY OF SITE HISTORY AND PREVIOUS INVESTIGATIONS

#### 3.1 FORUM CONSULTING ENGINEERS – 3 MARCH 2016 (REVISED 4 MARCH 2019)

The Forum Consulting Engineers Report (ref: 902079) details the findings of a preliminary contaminated site investigation undertaken in February 2016. Works consisted of a desktop review of site history and the collection of 7 soil samples from four locations across the site. The site history review identified the potential sources of contamination at the site to be the use of fill material at the site and the site being located within the Lead Contaminant Survey Grid, potentially being subject to lead fallout.

Laboratory analysis of collected soil samples for lead reported all concentrations below the applicable guidelines with the exception of sample TP1B collected from a depth of 0.4 – 0.45m below the existing surface level. Sample TP1B reported a concentration of lead greater than 250% of the applicable guideline, indicating that remediation/management was required in this portion of the site.

A copy of the summary of results for this investigation is provided in the attachments section of this report.

#### 3.2 AGILITY ENGINEERING – 30 SEPTEMBER 2019

The Agility Engineering Remedial Action Plan (ref: 2019233 – RAP) details remedial action required to make the site suitable for the proposed development as a senior college.

The results of the previous Forum investigation identified an elevated concentration of lead within an observed slag layer at 0.4m depth in sample location TP1 on the north eastern side of the existing site building. All other samples from across the site reported concentrations below the applicable site guidelines with no further observation of slag fill noted.

The RAP prepared by Agility Engineering considered the most appropriate remedial strategy to be the onsite management of contaminated soils by not disturbing the buried slag fill, placement of a geotextile fabric marker layer and capping with concrete hardstand to manage/eliminate the exposure pathway to human and/or ecological receptors.

The RAP also recommended the preparation of a validation report and long-term environmental management plan (EMP) at the successful completion of the remedial works.

#### **4. SITE GEOLOGY AND HYDROGEOLOGY**

Reference to the 1:100 000 Newcastle Coalfield Regional Geology Map published by Department of Mineral Resources indicates that the site lies within the Croudace Bay Formation of the Boolaroo Subgroup. The Croudace Bay Formation separates the Upper Pilot Seam from the overlying Fassifern Seam. The Croudace Bay Formation consists largely of the Belmont Conglomerate Member. The Belmont Conglomerate Member has a recorded maximum thickness of approximately 60m but shows very rapid variation over very short distances.

The site falls within the Warners Bay Landscape as identified on the “Soil landscapes of the Gosford-Lake Macquarie 1:100 000 Sheet” published by the Department of Land and Water Conservation. The Warners Bay Landscape is a residual landscape characterised by undulating to rolling rises and low hills on fine-grained sediments of the Newcastle Coal Measures. The Warners Bay Landscape is predominantly extensively cleared tall open-forest.

A groundwater bore search was undertaken using the Water-NSW online groundwater data system (<https://realtimedata.watarnsw.com.au/water.stm>). The groundwater bore search indicated there are no registered groundwater bores within 500m of the site.

## 5. VALIDATION FIELDWORK

Validation works at the site consisted of a visual inspection of the capping area on the north eastern side of the existing structure. It is noted that remedial works were completed without Agility Engineering being notified of the works being undertaken and inspection was only undertaken once works were completed.

Discussion with the site owner indicated that the concrete slab was 100mm in thickness and utilised the existing stormwater pipework, therefore minimal ground disturbance was required to complete the remediation. It is understood that there was no requirement to remove any material from the site during the remediation process. The RAP recommended the placement of a geotextile fabric marker layer below the concrete capping, however it is unknown if this was placed at the time of remediation, therefore it is recommended that the base of the concrete slab be used as the marker layer.

Photographs of the completed capping works are provided in the attachments section of this report.

## 6. SITE CHARACTERISATION

A total of seven soil samples were collected from four test locations at the site. The number of test locations is noted to be slightly less than the recommended six test locations for a site 0.1 to 0.2ha, however it is noted that the existing structure takes up a footprint of approximately one third of the site area and therefore it is considered the number of test locations sampled is in accordance with the minimum sampling density recommended by the NSW Sampling Design Guidelines.

Lead fallout and lead slag was considered to be primary contaminant of concern due to the proximity of the site to the former Pasminco smelter. Based on this, as the site is identified by Council as being within a "Lead Contamination Notification Area" and for the purposes of the Forum Contamination Investigation, all samples were analysed for lead. One location, TP1B – 0.4m, reported a concentration in soil in excess of the adopted site criteria, and therefore remediation of this portion of the site was considered to be required. The selected remedial option was the onsite management of contaminated soils by not disturbing the buried slag fill, placement of a geotextile fabric marker layer and capping with concrete hardstand to manage/eliminate the exposure pathway to human and/or ecological receptors.

It is understood that minimal ground disturbance was required during remedial works as the existing stormwater pipework was utilised for drainage and no material was required to be removed from the site. It is not known if a geotextile fabric marker layer was placed below the concrete hardstand, therefore

Agility Engineering recommends the use of the base of the concrete cap hardstand to act as the marker layer to be detailed within the LEMP for the site for ongoing site management.

It is considered that remediation were generally undertaken in accordance with the Agility Engineering RAP, with the pathway to general site users eliminated. It is noted that an LEMP is required to be prepared to manage any future maintenance works which may be required to penetrate the capping placed.

Following remediation the site is considered suitable for use as an educational establishment, subject to the requirements of the LEMP.

## **7. POST REMEDIATION CONCEPTUAL SITE MODEL**

Based on Agility Engineering's understanding of the site following the remediation works, the contamination present, exposure pathways, and receptors are considered as follows:

Lead contamination:

- Source – Following the remediation of the site, lead slag impacted fill material at the site has been placed below a new hardstand area of the site.
- Exposure Pathways – the primary exposure pathways are considered to be through ingestion of soil, as well as inhalation of soil/dust during site maintenance only. It is considered the exposure pathway for site use has been eliminated.
- Receptors – the residual contamination is located below the hardstand in the north eastern portion of the site and therefore potential receptors are considered to be future site maintenance works if penetration through the hardstand and excavation into the underlying fill material is required.

## **8. ONGOING SITE MANAGEMENT**

As the remedial action undertaken at the site consisted of onsite containment, it is considered that the site requires ongoing management in accordance with a Long-term Environmental Management Plan (LEMP). An LEMP has been prepared for the site under separate cover (ref: 2019233 – LEMP).

## **9. CONCLUSIONS AND RECOMMENDATIONS**

This report presents the findings of validation works undertaken in an area of approximately 110m<sup>2</sup> located in the north eastern portion of land identified as Lots 14 and 15 Section L DP 8993, No. 7 James Street, Argenton.

It was proposed that the existing site structure be refurbished for use as a senior college. Due to the presence of lead slag contaminated fill material identified in the north eastern portion of the site, remediation of the site was required to render the site suitable for the proposed use in accordance with the NEPM 2013.

Remediation at the site consisted of onsite containment of contaminated soils below a concrete hardstand capping layer to limit the potential for exposure of the identified contamination to site users.

Following validation of remediation works, Agility Engineering consider the site is suitable for use as an educational establishment, subject to management in accordance with the LEMP prepared for the site.

## 10. LIMITATIONS

Agility Engineering have performed investigation and consulting services for this project in general accordance with current professional and industry standards. The findings contained within this report are the result of site observations, field investigation and limited laboratory test. The extent of testing was limited to discrete test locations and variations that cannot be inferred or predicted may occur in ground conditions between test locations. To the best of our knowledge, information presented in this report represents a reasonable interpretation of the general condition of the site. Under no circumstances, however, do these findings represent the actual state of the site at all points.

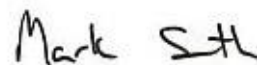
The programme of field sampling and interpretations presented within this report are limited in nature and Agility Engineering, or any other reputable consultant, cannot provide unqualified warranties, nor does Agility Engineering assume liability for site conditions not accessible during the time of the investigation.

Agility Engineering Consulting Engineers should be contacted immediately should subsurface conditions be found to differ from those described in this report.

### Agility Engineering Pty Ltd



**Matthew Clark**  
Geo-Environmental Scientist



**Mark Smith**  
Geo-Environmental Engineer  
Director

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# ATTACHMENTS

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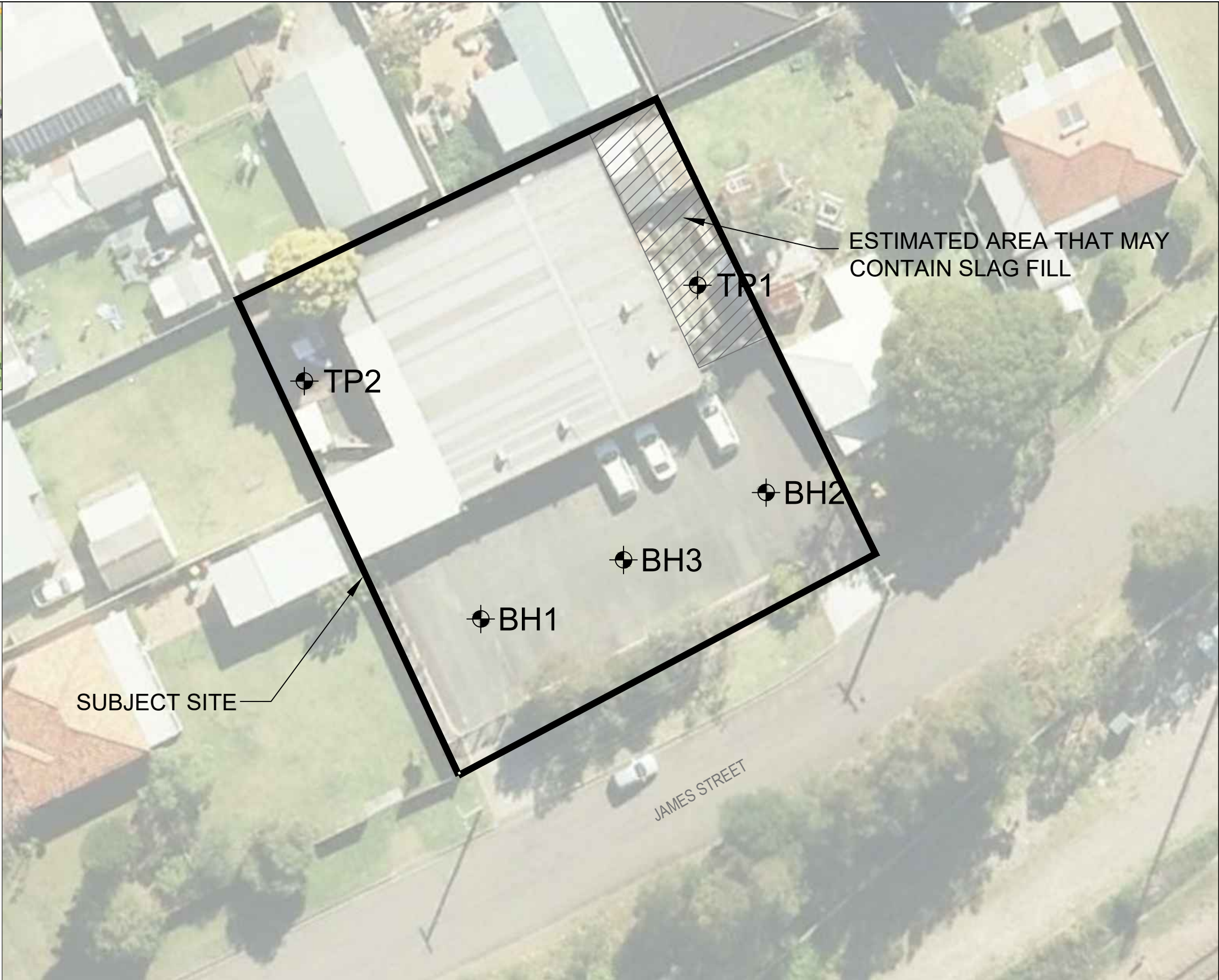
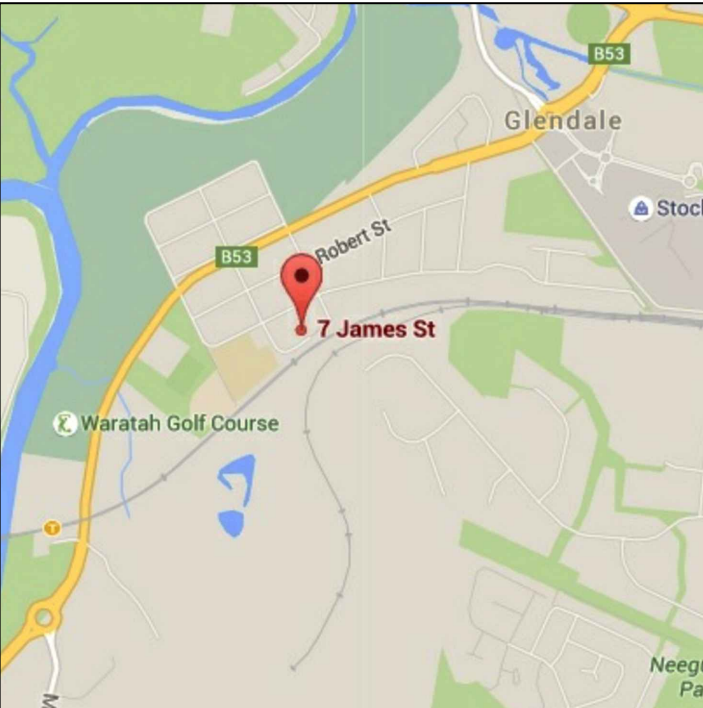
**Photograph 1** – Looking north across the area of concrete capping.



**Photograph 2** – Looking north-west at the rear site boundary. Note drainage grates



**Photograph 3** – Looking south across the area of capping.



LEGEND:  
BH1/TP1 - APPROXIMATE BOREHOLE/TESTPIT LOCATION



TITLE SITE PLAN LOTS 14 & 15 SECTION L DP 8993 No. 7 JAMES STREET ARGENTON	CLIENT ALESCO SENIOR COLLEGE	SCALE NOT TO SCALE
	DATE 19/09/2019	DRAWING No. 2019233-SIT-01
	DRAWN M.C	REVISION 0

Sample Identification	Depth (m)	Date Sampled	Filling (F) / Natural (N)	Material type/Geotechnical Unit <sup>A</sup>	Metals	Pb
BH1A	0.25 - 0.4	3.02.16	N	Unit 5		29
BH1B	0.4 - 0.6	3.02.16	N	Unit 6		27
BH2A	0.1 - 0.25	3.02.16	F	Unit 3		31
BH2B	0.8 - 0.9	3.02.16	N	Unit 7		10
TP1 A	0.1 - 0.2	3.02.16	F	Unit 2		220
TP1 B	0.4 - 0.45	3.02.16	F	Unit 4		<b>1500</b>
TP2 A	0.1 - 0.25	3.02.16	N	Unit 5		120
Guideline Values				PQL		5
*NEPM (2013) HILs for Residential Land Use with garden/accessible soil (HIL A)						300
**NEPM (2013) EIL for Urban Residential/Public Open Space						1100

All units are in mg/kg

PQL = Practical Quantitation Limit

\*National Environmental Protection Measure (NEPM) 1999 (Amended April 2013) Health Investigation Level (HIL) A - residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake, (no poultry), also includes children's day care centres, preschools and primary schools

\*\*National Environmental Protection Measure (NEPM) 1999 (Amended April 2013) Environmental Investigation Levels (EIL) for Urban Residential/Public Open Space

HIL guideline for chromium is based on chromium (VI)

EIL for lead is derived for aged contamination (>2years)

Adopted EIL for lead are generic contaminant limits for any soil type

<sup>A</sup> Geotechnical unit descriptions are shown in Table 4 in the main body of the report

**Bold** - Indicates exceedance of NEPM (2013) HIL C criteria values

*Italics* - Indicates exceedance of NEPM (2013) EIL criteria values for Urban Residential/Public Open Space

Shaded - Indicates exceedance by 250% of NEPM (2013) HIL C criteria values

# Geotechnical General Notes



## Introduction

These notes have been provided in order to explain your geotechnical report. Not all elements are necessarily relevant to all reports.

## Geotechnical Report

This geotechnical report is based on information gained from personal local experience, understanding of local geology, limited site investigation, subsurface sampling and/or laboratory testing. This report is tailored to provide information relevant to the scope of the project. Agility have performed the geotechnical investigation in general accordance with current professional and industry standards.

The extent of testing was limited to discrete test locations and variations that cannot be inferred or predicted may occur in ground conditions between test locations. To the best of our knowledge, information presented in this report represents a reasonable interpretation of the general condition of the site. Under no circumstances, however, do these findings represent the actual state of the site at all points. For this reason, this report must be regarded as interpretive rather than as a factual document as the report is limited by the scope of information on which interpretations are based upon. Site access constraints such as existing dwellings, steep sloping sites, dense vegetation and underground services may limit the understanding of the sub-surface profile across the site.

This geotechnical engineering report is based on conditions which existed at the time of subsurface exploration. Without approval from Agility Engineering, this report should not be used if there are any changes to the scope of the project or changes to the site conditions. Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and thus, the reliability of this geotechnical report. Without consultation, Agility Engineering will not accept responsibility for problems that occur due to project modifications and/or site modifications. The programme of field sampling, laboratory testing and interpretations presented within this report are limited in nature and Agility Engineering does not assume liability for site conditions not accessible during the time of the investigation.

Agility Engineering should be contacted immediately should subsurface conditions be found to differ from those described in this report.

## Engineering Logs

The engineering logs (borehole, test pit logs presented in this report are a geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling and the possibility of other than 'straight line' variations between the test locations.

## Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils, groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an inaccurate indication of the true water table;
- Water table levels will vary from time to time with seasons, weather and/or tidal events. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable groundwater observations may be made by installing piezometer standpipes which may be monitored over variable extended timeframes.

## Tree Effects

Due to complex tree root geometry, variable moisture extraction by trees and the difficulty in predicting future tree growth, a precise design for the effects of trees is outside current knowledge. The owner must be aware that although precautions have been taken for the effects of trees in our design, some distortion must be accepted. Engineers are not experts in tree growth and cannot be expected to know the anticipated growth and mature height of trees.

## Site Inspection

Agility Engineering will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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# Soil & Rock Classification



## Description and Classification Methods

The description and classification of soils and rocks used within this report are based on descriptions and classifications detailed in Australian Standard AS 1726:2017.

## Soil Types

AS 1726:2017 defines soil as particulate materials that occur in the ground and can be disaggregated or remoulded by hand in air or water without prior soaking. The dominant soil component is given capital letters and secondary and minor soil components are given lower case letters. FILL and TOPSOIL are also given block letters and are indicated at the beginning of the soil description.

## Particle Size of Soil Components

Type		Particle size (mm)
	BOULDERS	>200
	COBBLES	63 - 200
Coarse grained soil	GRAVEL Course	19 - 63
	GRAVEL Medium	6.7 - 19
	GRAVEL Fine	2.36 – 6.7
	SAND Course	0.6 – 2.36
	SAND Medium	0.21 – 0.6
	SAND Fine	0.075 – 0.21
	SILT	0.002 - 0.075
Fine grained soil*	CLAY	<0.002

\* Fine grained soils to be described from engineering behaviour by visual tactile techniques

## Fine Grained Soil Plasticity

Soil plasticity is characterised from the liquid limit of silts and clays. When laboratory tests are not available, plasticity is estimated using field visual and tactile methods.

Plasticity	Liquid limit for silt	Liquid limit for clay
Non-plastic	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35, ≤50
High plasticity	>50	>50

## Course Grained Soil Particle Characteristics

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - one or more intermediate sizes poorly represented
- Gap graded – one or more intermediate sizes absent
- Uniform - an excess of a particular particle size

Where significant, particle shape can be defined as being rounded, sub-rounded, sub-angular, angular, flaky, platy or elongated.

## Moisture Condition

Soil Type	Moisture Condition	Description
Course grained soil	Dry (D)	Non-cohesive and free running
	Moist (M)	Soil cool, darkened and sticks together
	Wet (W)	Soil cool dark, free water forms when handling
Fine grained soil	w<PL	Soil dryer than plastic limit, hard and friable or powdery
	w ~PL	Soil near plastic limit, can be moulded
	w >PL	Soil wetter than plastic limit, soil usually weakened, free water forms when handling

## Cohesive Soil Consistency

Cohesive soils include fine grained soils and coarse grained soils with sufficient fine grained components to induce cohesive behaviour. Consistency describes the ease with which a soil can be remoulded measured by the indicative undrained shear strength of the soil or assessed by field tests.

Consistency	Abbreviation	Undrained shear strength (kPa)
Very Soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very Stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

## Relative Density of Non-Cohesive, Coarse Grained Soils

Non-cohesive soils are classified on the basis of relative density, generally assessed from penetration test procedures and well-established correlations.

Relative Density	Abbreviation	Density Index %
Very loose	VL	<15
Loose	L	15 - 35
Medium Dense	MD	35 - 65
Dense	D	65 - 85
Very Dense	VD	>85

## Rock Classification

The rock type is given in capital letters followed by the grain size, colour, fabric and texture of the rock. The degree of weathering and the rock material strength classification are provided. Where no point load strength index or laboratory testing was undertaken, rock strength will be estimated using field assessment techniques in accordance with AS 1726:2017 or estimated from drilling resistance.