Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Assessment of Geotechnical Conditions

Proposed Rezoning
1 Crescent Street, Holroyd

Prepared for
Tiberius (Parramatta) Pty Ltd

Project 84770.00
May 2015

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		14 May 2015
Reviewer		14 May 2015

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Executive Summary

This report presents the results of an assessment of geotechnical conditions undertaken for the proposed rezoning of 1 Crescent Street, Holroyd. The project involves the preparation of a Masterplan for rezoning of the site from the current industrial zoning, and ultimately seeks mixed-use redevelopment incorporating high-density residential, commercial/retail and open space.

The site is an irregular shape with a length of some 400 m (east-west) and a width varying between 60 m and 120 m (north-south). It is bounded by Holroyd Sportsground and the M4 Motorway to the north, Woodville Road to the east, Crescent Street and a railway corridor to the south, and commercial/industrial premises to the west. The site is currently occupied by WesTrac as a maintenance and service facility for earthmoving equipment. The site is relatively flat with surface levels ranging from about RL 10 m to RL 12 m relative to the Australian height datum (AHD).

The *Penrith 1:100 000 Geological Series Sheet* indicates that the north-eastern corner of the site is underlain by Quaternary-aged alluvial sediments and the remainder of the site is underlain by Ashfield Shale of the Wianamatta Group. The *Prospect/Parramatta River 1:25 000 Acid Sulfate Soil Risk Map* shows that the northern portion of the site is 'Disturbed Terrain' which may or may not be affected by acid sulphate soils.

Previous investigations by Douglas Partners indicate that the northern portion of the site was underlain by landfill refuse prior to its redevelopment. The depth of this refuse varied but at its deepest was in excess of 8 m. The refuse is understood to have been placed during backfilling of the former creek prior to the construction of the stormwater channel. Methane gas has previously been detected in the areas underlain by refuse.

It appears as though some form of remediation was undertaken with refuse encapsulated along the southern boundary of the site adjacent to Crescent Street during construction of the Gough & Gilmour facility. The depth of the encapsulated refuse appears to be between 3.5 m and 7.0 m. Previous investigations indicate that the refuse included varying proportions of shale, sandstone, brick, glass, concrete, copper wire, steel, bitumen, tar, timber, plastic and ash.

The natural soils underlying the refuse in the northern portion of the site appear to be soft alluvial clays. The natural soils elsewhere on the site appear to be stiff to hard residual clays. Weathered bedrock is in the order of 4 m to 8 m in the northern portion of the site. The depth to rock may be shallower in the southern portion of the site although excavation for the encapsulation cells may have altered the natural landform.

Groundwater has previously been observed between RL 4.4 m and RL 11.2 m AHD with an average groundwater level in the order of RL 7 m AHD. The presence of refuse filling is likely to cause variations in groundwater levels due to perched water within the filling.

Although further investigations and consideration of various geotechnical issues will be required when planning future development works, there is nothing to suggest that rezoning of the site for high-density residential, commercial/retail and open space land uses cannot be undertaken from a geotechnical perspective.

Douglas Partners
Geotechnics / Environment / Groundwater

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Report on Assessment of Geotechnical Conditions
Proposed Rezoning
1 Crescent Street, Holroyd

1. Introduction

This report presents the results of an assessment of geotechnical conditions undertaken for the proposed rezoning of 1 Crescent Street, Holroyd. The work was commissioned by Tiberius (Parramatta) Pty Ltd in consultation with McKenzie Group Planning.

The project involves the preparation of a Masterplan for rezoning of the site from the current industrial zoning, and ultimately seeks mixed-use redevelopment incorporating high-density residential, commercial/retail and open space. This report provides an assessment of geotechnical conditions based on available information. A separate report will assess the contamination risks.

The geotechnical assessment is based on available published information, a site inspection and the results of several previous investigations undertaken on the site by Douglas Partners. The results of the assessment as well as advice on geotechnical constraints are included in this report.

2. Site Description

The site is an irregular shape with a length of some 400 m (east-west) and a width varying between 60 m and 120 m (north-south). It is bounded by Holroyd Sportsground and the M4 Motorway to the north, Woodville Road to the east, Crescent Street and a railway corridor to the south, and commercial/industrial premises to the west. A concrete-lined stormwater channel is located immediately adjacent to the northern site boundary and flows to the north-east. A 3 m to 4 m high retaining wall supports the site on the southern side of the channel.

The site is currently occupied by WesTrac as a maintenance and service facility for earthmoving equipment. It includes a large workshop and office building in the central portion of the site, vehicle parking areas in the eastern area and machinery storage in the western area. Hardstand pavements are present over the majority of the site with some unsealed pavement areas to the west.

The site is relatively flat with surface levels ranging from about RL 10 m to RL 12 m relative to the Australian height datum (AHD). The natural topography in the area slopes downwards towards the stormwater channel which was once the unformed A'Becketts Creek.

The study area overlain on an aerial photograph is shown on Drawing 1 in Appendix B.

3. Regional Geology

The *Penrith 1:100 000 Geological Series Sheet* indicates that the north-eastern corner of the site is underlain by Quaternary-aged alluvial sediments and the remainder of the site is underlain by Ashfield Shale of the Wianamatta Group. Ashfield Shale typically comprises black to dark-grey shale and laminite. However, it is known that landfilling has previously been undertaken on and adjacent to the site and the mapping is not necessarily accurate.

An extract of the published geological map is shown in Figure 1.

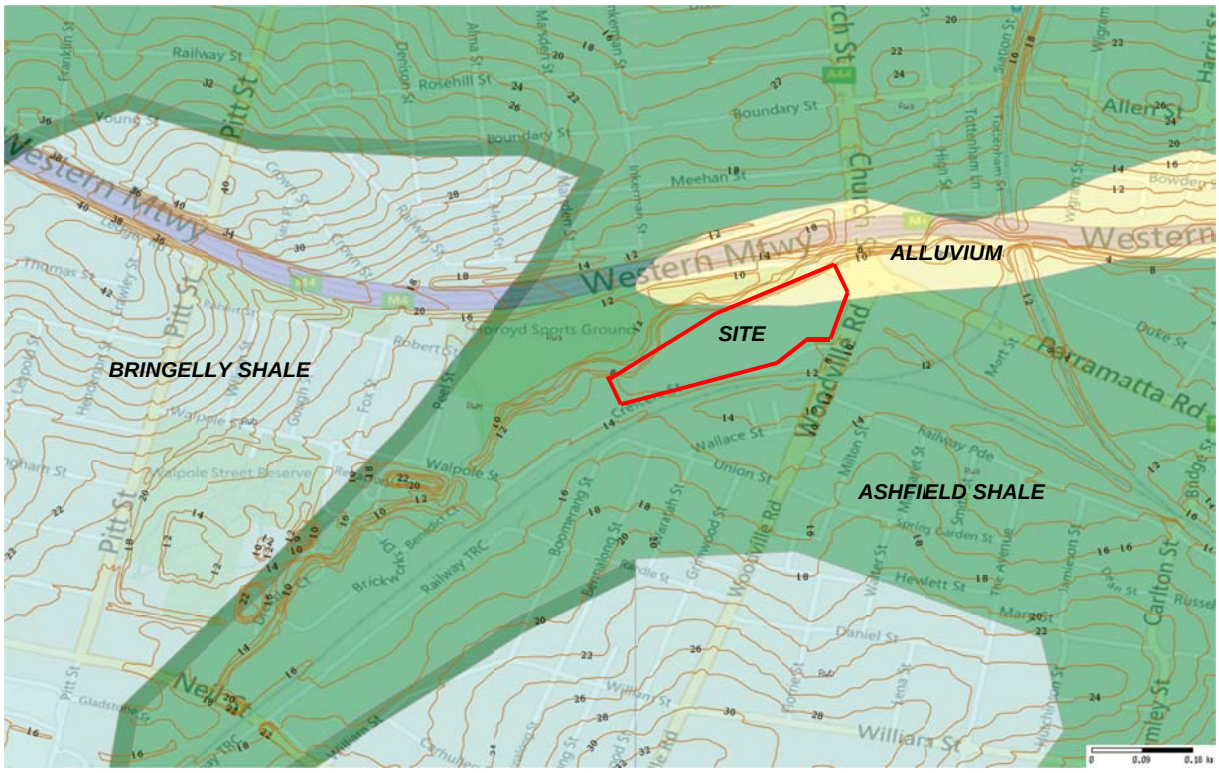


Figure 1: Extract from geological map

4. Acid Sulphate Soils

The *Prospect/Parramatta River 1:25 000 Acid Sulfate Soil Risk Map* shows that the northern portion of the site is 'Disturbed Terrain' which may or may not be affected by acid sulphate soils. This area corresponds to the area mapped as alluvium in Figure 1. The remainder of the site is unlikely to be affected by acid sulphate soils

An extract of the published acid sulphate soil risk map is shown in Figure 2.

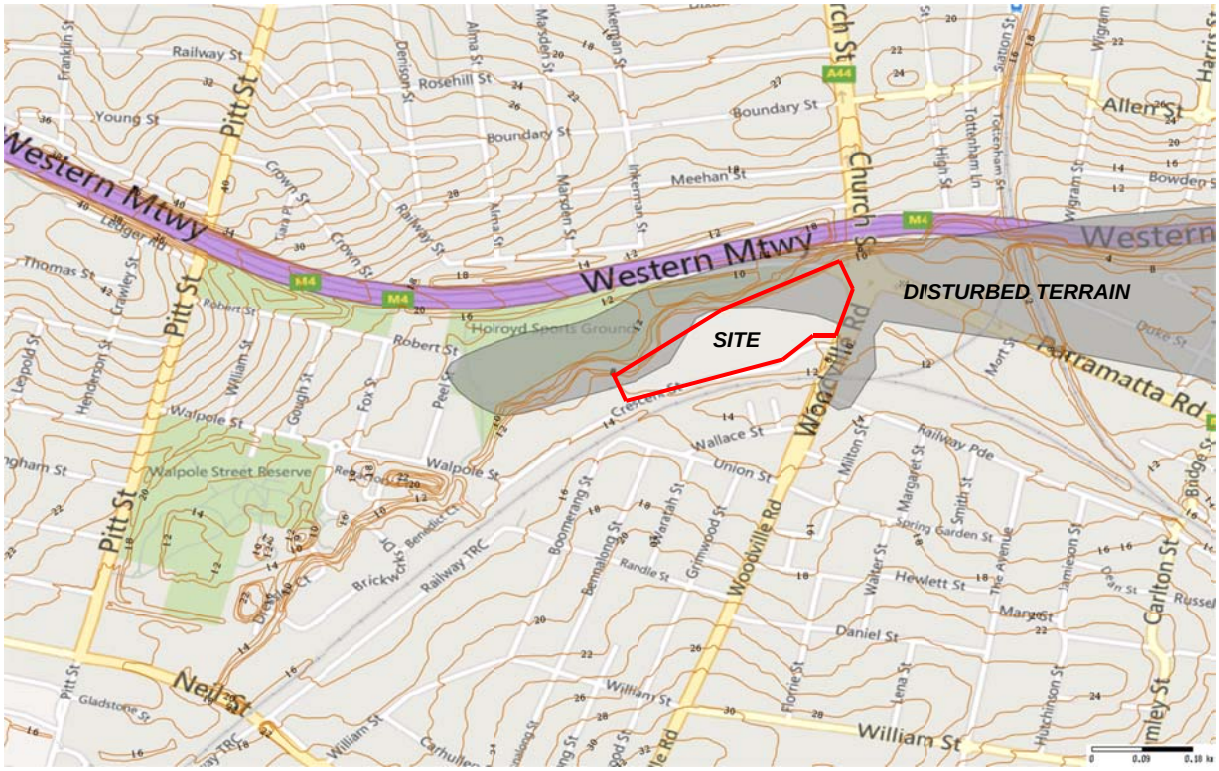


Figure 2: Extract from acid sulphate soil map

5. Previous Investigations

Douglas Partners has previously undertaken numerous investigations on the site. Investigations with information relevant to this geotechnical assessment include:

- Project 19689 (1993) – Subgrade and pavement investigation for the Gough & Gilmour development. This investigation included nine test pits to depths of between 1.0 m and 1.6 m.
- Project 19689A (1993) – Review of contamination issues associated with the Gough & Gilmour development. This investigation included a review of several reports prepared by another consultant.
- Project 19689B (1993) – Contamination assessment for the Gough & Gilmour development. This investigation included 24 test pits excavated to depths of 0.5 m to 7.0 m, four boreholes drilled to depths of 6.0 m to 8.0 m, the installation of four groundwater wells and the installation of 12 methane monitoring probes.
- Project 19689C (1994) – Monitoring of groundwater levels and methane gas concentrations in the wells/probes.
- Project 19689D (1994) – Monitoring of groundwater levels in the wells.
- Project 19689E (1994) – Advice on remediation options for the site.
- Project 19689G (1994) – Supplementary geotechnical investigation for the Gough & Gilmour development. This investigation included six boreholes drilled to depths of 9.2 m to 11.8 m.

- Project 19689H (2001) – The installation of four groundwater monitoring wells, a hydrogeological assessment of the site and additional drilling to assess the composition of refuse along the Crescent Street boundary of the site.
- Project 19689I (2001) – The installation of three gas monitoring wells.
- Project 19689J (2001) – The installation of one gas monitoring well.

It is unclear whether the site was partially or wholly remediated prior to or during the development of the current site improvements. Selected test pit logs from our previous work are attached in Appendix C and their approximate locations are shown on Drawing 1 in Appendix B. These pits were selected as they were measured relative to AHD at the time of the field work, however it is not known whether the pits remain representative of current subsurface conditions.

6. Preliminary Geotechnical Model

The previous investigations indicate that the northern portion of the site was underlain by landfill refuse prior to the Gough & Gilmour redevelopment. The depth of this refuse varied but at its deepest was in excess of 8 m. The refuse is understood to have been placed during backfilling of the former creek prior to the construction of the stormwater channel. Methane gas has previously been detected in the areas underlain by refuse.

It appears as though some form of remediation was undertaken with refuse encapsulated along the southern boundary of the site adjacent to Crescent Street during construction of the Gough & Gilmour facility. The depth of the encapsulated refuse appears to be between 3.5 m and 7.0 m. Previous investigations indicate that the refuse included varying proportions of shale, sandstone, brick, glass, concrete, copper wire, steel, bitumen, tar, timber, plastic and ash.

The natural soils underlying the refuse in the northern portion of the site appear to be soft alluvial clays. The natural soils elsewhere on the site appear to be stiff to hard residual clays. Weathered bedrock is in the order of 4 m to 8 m in the northern portion of the site. The depth to rock may be shallower in the southern portion of the site although excavation for the encapsulation cells may have altered the natural landform.

Groundwater has previously been observed between RL 4.4 m and RL 11.2 m AHD with an average groundwater level in the order of RL 7 m AHD. The presence of refuse filling is likely to cause variations in groundwater levels due to perched water within the filling.

The approximate locations of the refuse identified in the northern portion of the site and the encapsulation zones adjacent to Crescent Street are shown in Drawing 2 in Appendix B.

7. Likely Geotechnical Issues

The geotechnical issues associated with future development on the site will be dependent on the nature of each individual structure. However, the following comments have been provided to address the potential issues that may rise during redevelopment of the site.

- The depth to weathered bedrock appears to be in the order of 4 m to 8 m. Excavations in the overlying filling and soils should be readily achievable using conventional earthmoving equipment such as hydraulic excavators with bucket attachments.
- Excavation in low, medium and high strength shale/siltstone and laminite (if required) will generally require the use of heavy ripping equipment, rock hammers and/or rock saws.
- The disturbance of refuse materials should be avoided or minimised where possible to reduce the environmental impacts of the works and the costs of disposing of the materials.
- Vertical excavations in filling, clayey soils and weathered rock are not expected to be stable for any significant period of time. Over-excavation of the filling on the site will probably need to be avoided to reduce disposal/re-encapsulation costs and therefore shoring support will be needed to allow basements to be excavated with vertical sides.
- The type of shoring support required may vary on the site depending on the location of the excavation and the depth. Soldier piles with infill shotcrete panels or contiguous piles may be suitable for excavations in clayey soils above the groundwater table and away from refuse materials. Water-tight and vapour-tight walls (e.g. secant piles, diaphragm walls etc.) may be required below the groundwater table and in the event landfill gases are detected.
- Basements may need to be fully tanked in areas of the site if groundwater and landfill gas issues arise.
- Landfill gas drainage and barrier systems may need to be incorporated into the new structures in areas of the site in which landfill gas is still being produced or is present within the refuse. This would typically include free-draining gravel encapsulated in a gas-proof membrane and connected to a series of pipes and extraction fans or vents to reduce the risk of landfill accumulation below and within the new structures.
- New structures will probably have to be supported by piles founded in the bedrock underlying the site. The existing filling materials will not be suitable for supporting structural loads.
- Some form of subgrade improvement may be required for new pavements in areas underlain by deep filling/refuse.

Although further investigations and consideration of various geotechnical issues will be required when planning future development works, there is nothing to suggest that rezoning of the site for high-density residential, commercial/retail and open space land uses cannot be undertaken from a geotechnical perspective.

8. Further Investigations

Extensive geotechnical investigations will be required on the site to plan and design the proposed structures and improvements at the development application stage. Investigations will be required to:

- Delineate of areas underlain by deep filling/refuse to enable the locations of buildings to be selected to minimise disturbance of refuse, and exposure to landfill gas and leachate.
- Determine the depth to and strength of the bedrock to enable foundation levels to be determined.
- Identify the strengths of the overburden materials for the design of shoring walls/basement structures.
- Groundwater quality testing to determine disposal options and aggressivity of the groundwater to concrete and steel.
- Subgrade strength along the proposed road alignments to enable pavement design to be undertaken.
- Assess potential requirements for gas mitigation measures and other related environmental issues that may need to be considered in tandem with the geotechnical aspects of the project.

Although not currently monitored, we understand there may be existing groundwater and gas monitoring wells that may still be operational and may be able to be used to assess current conditions on the site. Additional wells may also need to be installed. A scope of works should ideally be prepared by the geotechnical consultant in consultation with the structural and civil designers at the time of the development.

9. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for 1 Crescent Street, Holroyd in accordance with DPs proposed dated 10 March 2015. The report is provided for the use of Tiberius (Parramatta) Pty Ltd for this project only and for the purpose(s) described in the report. It should not be used for other projects or by a third party.

DPs advice is based upon the conditions encountered during several previous investigations. The accuracy of the advice provided by DP in this report may be limited by undetected variations in ground conditions between sampling locations. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

This report must be read in conjunction with all of the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion given in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk.

Douglas Partners Pty Ltd

Appendix A

About this Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or 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 erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. 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 measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

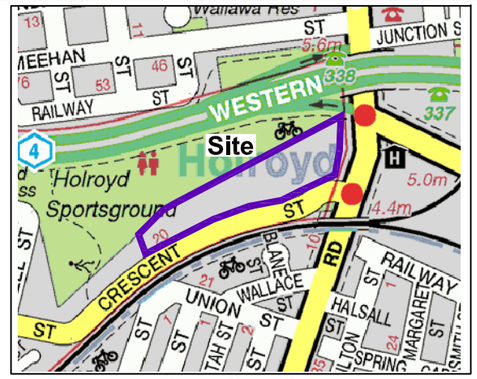
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company 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.

Appendix B

Drawings



Locality Plan

NOTE:
1. Base drawing from Nearmap.com

0 5 10 20 30 40 50 75 100 150m
1:1500 @ A3

LEGEND

Douglas Partners Test Pit 1993 (Project 19689B)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Tiberius (Parramatta) Pty Ltd		TITLE: **Site Location Plan**
OFFICE: Sydney	DRAWN BY: PSCH	**Proposed Rezoning**
SCALE:1:1500@ A3 approx.	DATE: 6.5.2015	**1 Crescent Street, HOLROYD**

PROJECT No: 84770.00
DRAWING No: 1
REVISION: 0

NOTE:
1. Base drawing from Nearmap.com

0 5 10 20 30 40 50 75 100 150m

1:1500 @ A3

LEGEND

Approximate area underlain by potential refuse

Possible locations of re-burial cells

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Tiberius (Parramatta) Pty Ltd		TITLE: **Potential Existing Location of Buried Refuse**	PROJECT No: 84770.00
OFFICE: Sydney	DRAWN BY: PSCH	**Proposed Rezoning**	DRAWING No: 2
SCALE: 1:1500@ A3 approx.	DATE: 6.5.2015	**1 Crescent Street, HOLROYD**	REVISION: 0

Appendix C

Selected Previous Field Work Results
(December 1993)

TEST PIT REPORT

CLIENT: NORTHROP HOLMES
PROJECT: CONTAMINATION ASSESSMENT
LOCATION: AGL SITE GRANVILLE

DATE: 16.12.93
PROJECT No.: 19689B
SURFACE LEVEL: 11.8 AHD

PIT No. 202
SHEET 1 OF 1

Depth m	Description of Strata	Sampling & Testing: Type	Depth (m)	Results Headspace PID (ppm)
0	FILLING – brown grey silty clay filling with some rubble	D	0.15	9
1.0	FILLING – brown and grey silty clay with rock fragments and minor rubble and glass	D	1.2	
1.8	FILLING – dark grey shale broken			
2.3	FILLING – firm brown and red brown grey clay			
3.3	SILTY CLAY – grey mottled yellow and brown clay damp to moist in parts	D	4.0	1
		D	6.5	2
6.7	TEST PIT DISCONTINUED AT 6.7m – limit of machine			

RIG: CATERPILLAR 225. 1.25m BUCKET
LOGGED: RKL

GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED

REMARKS: PIT LOCATED IN MOUND ELEVATED APPROXIMATELY 1m

SAMPLING & TESTING

D disturbed sample
B bulk sample
pp pocket penetrometer (kPa)
Ux x mm dia. tube

CHECKED:
Initials: RLC
Date: 10/1

D.J. Douglas & Partners

TEST PIT REPORT

CLIENT: NORTHROP HOLMES
PROJECT: CONTAMINATION ASSESSMENT
LOCATION: AGL SITE GRANVILLE

DATE: 17.12.93
PROJECT No.: 19689B
SURFACE LEVEL: 11.4 AHD

PIT No. 205A
SHEET 1 OF 1

Depth m	Description of Strata	Sampling & Testing: Type	Depth (m)	Results Headspace PID (ppm)
0	FILLING – brown and grey silty clay with concrete, rubble, brickbats, glass and metal etc			
4.8	RUBBISH – dark grey and black silty clay sand rubbish/waste, paper, rubber, glass, metal (wet with oil sheen). Battery cases wire with landfill odour	D	5.0	32
		D*	5.5	5
		D*	5.6	12
7.0	TEST PIT DISCONTINUED AT 7.0m – limit of machine			

RIG: CATERPILLAR 225. 1.25m BUCKET

LOGGED: RKL

GROUND WATER OBSERVATIONS: SEEPAGE FROM 5.5m SAMPLE TAKEN

REMARKS:

SAMPLING & TESTING

D disturbed sample
B bulk sample
pp pocket penetrometer (kPa)
Ux x mm dia. tube

CHECKED:
Initials:
Date:

D.J. Douglas & Partners

TEST PIT REPORT

CLIENT: NORTHROP HOLMES
PROJECT: CONTAMINATION ASSESSMENT
LOCATION: AGL SITE GRANVILLE

DATE: 21.12.93
PROJECT No.: 19689B
SURFACE LEVEL: 6.6 AHD

PIT No. 211
SHEET 1 OF 1

Depth m	Description of Strata	Sampling & Testing: Type	Depth (m)	Results Headspace PID (ppm)
0	FILLING – brown silt and rounded cobbles			
0.4	FILLING – brown and dark grey silty clay with rubble, concrete, bricks , telegraph pole (?), plastic			
1.7	SILTY CLAY – firm brown and grey silty clay black in parts with organic matter	D	2.2	<1
3.0	TEST PIT DISCONTINUED AT 3.0m Note: Rubbish in South end of pit 1.9 to 2.4m with landfill odour			

RIG: CATERPILLAR 225. 1.25m BUCKET

LOGGED: RKL

GROUND WATER OBSERVATIONS: INFLOW FROM CHANNEL AT 1.5m IN N END OF PIT

REMARKS: INFLOW FROM RUBBISH @ 2.0m IN SOUTH END OF PIT. STANDPIPE INSTALLED TO 3.30m WATER LEVEL @ 1.74m AFTER 3 HRS. SAMPLE TAKEN.

SAMPLING & TESTING

D disturbed sample
B bulk sample
pp pocket penetrometer (kPa)
Ux x mm dia. tube

CHECKED:
Initials: RKL
Date: 10/1

D.J. Douglas & Partners

TEST PIT REPORT

CLIENT: NORTHROP HOLMES
PROJECT: CONTAMINATION ASSESSMENT
LOCATION: AGL SITE GRANVILLE

DATE: 21.12.93
PROJECT No.: 19689B
SURFACE LEVEL: 11.7 AHD

PIT No. 213
SHEET 1 OF 1

Depth m	Description of Strata	Sampling & Testing: Type	Depth (m)	Results Headspace PID (ppm)
0.05	ROADBASE			
0.3	FILLING – red brown gravelly clay			
0.6	FILLING – brown and dark grey roadbase			
0.8	SILT – hard dark brown then light brown silt	D	1.0	<1
1.1	SILTY CLAY – very stiff mottled yellow brown silty clay	D	1.2	<1
1.5	CLAY – very stiff to hard grey mottled red and yellow brown clay			
	TEST PIT DISCONTINUED AT 1.5m Note: brick rubble near surface in North end of pit			

RIG: CATERPILLAR 225. 1.25m BUCKET

LOGGED: RKL

GROUND WATER OBSERVATIONS: NO FREE GROUND WATER OBSERVED

REMARKS:

SAMPLING & TESTING

D disturbed sample
B bulk sample
pp pocket penetrometer (kPa)
Ux x mm dia. tube

CHECKED:
Initials: RLL
Date: 10/1

D.J. Douglas & Partners

TEST PIT REPORT

CLIENT: NORTHROP HOLMES6
PROJECT: CONTAMINATION ASSESSMENT
LOCATION: AGL SITE GRANVILLE

DATE: 21.12.93 – 23.12.93
PROJECT No.: 19689B
SURFACE LEVEL: 10.70 AHD

PIT No. 215
SHEET 1 OF 1

Depth m	Description of Strata	Sampling & Testing: Type	Depth (m)	Results Headspace PID (ppm)
0	FILLING – brown sandy and clayey silt and silty sand with brick rubble HP gas pipe. Minor steel reinforcing bar	D	0.7	2
0.7	FILLING – dark brown silty clay filling with concrete, timber and dark grey zones/layers of rubbish of glass, plastic, metal, some A.G. sheeting, rubber (tyre offcuts) – with landfill odour			
4.6	FILLING – wet gravelly clay with minor rubble and glass			
5.5	TEST PIT DISCONTINUED AT 5.5m			

RIG: CATERPILLAR 225. 0.6m BUCKET
LOGGED: RKL

GROUND WATER OBSERVATIONS: FREE GROUNDWATER OBSERVED AT 4.7m

REMARKS: PTI CAVING BELOW 4.6m

SAMPLING & TESTING

D disturbed sample
B bulk sample
pp pocket penetrometer (kPa)
Ux x mm dia. tube

CHECKED:
Initials: RLC
Date: 10/1

D.J. Douglas & Partners