



609-621 Burwood Highway, Knoxfield

Geotechnical Assessment

Development Victoria

May 2017

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Introduction

Development Victoria is considering to develop land at 609-621 Burwood Highway, Knoxfield. The site is currently government owned and controlled by the Department of Environment, Land, Water and Planning for the purposes of a horticulture research station. The site is approximately 19 Ha, bounded by Burwood Highway and Scoresby Road, and is located adjacent to Knox City Shopping Centre and Fairhills High School. It is understood that Development Victoria wish to undertake a Geotechnical due diligence assessment of the site to inform the rezoning application.

Glossary

The following abbreviations are contained within this report and explained for further understanding.

CICL	Cast Iron Cement Lined
CONC	Concrete
PE	Polyethylene
UPVC	Unplasticized Polyvinyl Chloride
OPVC	Oriented Polyvinyl Chloride
HDPE	High Density Polyethylene
MDPE	Medium Density Polyethylene
MSCL	Mild Steel Cement Lined
MSW	Mild Steel Welded
Dia	Diameter
kVA	Kilo Volt Amps
DBYD	Dial Before Your Dig

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1 Geotechnical Desktop Study

1. Introduction

1.1 Purpose of this Report

The purpose of this geotechnical desktop study is to provide Development Victoria with an understanding of the site geology, groundwater levels and geotechnical conditions relevant to the site based on available information and a site walkover. The preliminary desktop study will provide information to inform further investigation at the site and highlight any geotechnical considerations for the proposed future design and construction.

2. Methodology

2.1 Desktop Study

The preliminary desktop study of the site has been undertaken using available resources and any past GHD knowledge of the geological and groundwater conditions in the vicinity of the proposed development site.

The information used as a reference during the desktop study includes the following:

- Geological Survey of Victoria;
- The Department of Economic Development, Jobs, Transport & Resources (DEDJTR) resources and databases;
- The Department of Environment, Land, Water and Planning groundwater resources and databases;
- Existing borehole databases including WMIS, MMBW and GEDIS;
- Peck, Neilson, Old and Seddon (eds.) (1992) Engineering Geology of Melbourne, Balkema, Rotterdam;
- Preliminary Environmental Site Assessment, Chadwick Geotechnical, 2006

2.2 Site Walkover

A site walkover was carried out by a GHD Geotechnical Engineer on 13 October 2015 accompanied by members of the Development Victoria project team.

The site walkover was undertaken to assist with obtaining information on the following:

- Visual observations of surface conditions to note any potential geological features and gain understanding on past site use and current condition.
- Identification of potential earthworks/geotechnical considerations for future uses based on the topography and past use of the site.

3. Desktop Study Results

3.1 Topography

The proposed development site is located at the corner of Burwood Highway and Scoresby Road and covers an approximate surface area of 19 Ha. The site contains two key areas, being the 'northern portion' and 'southern portion'. The site is currently owned by the Department of Environment, Land, Water and Planning (DELWP) and has been historically used for horticultural research purposes.

3.1.1 Southern Portion

The southern portion of the site as presented in Figure 1 is bounded by the Burwood Highway and Scoresby Road to the south and east respectively. A section of the existing DELWP site will remain functional and be located to the west, with the existing access road from Scoresby Road bordering the 'southern portion' of the site to the north.

The natural profile of the southern portion is understood to slope to the north at approximately 1 V:30 H, with the exception of the area containing existing building infrastructure which appears to have been approximately levelled prior to construction.

3.1.2 Northern Portion

The northern portion of the site is bounded to the west by a light industrial/commercial precinct, a residential development and school grounds of Fairhills High School to the east and Blind Creek to the north. This portion of the site typically grades towards Blind Creek at a maximum gradient of 1V:10H and comprises mainly open grassland with some established trees and hothouse structures previously used for horticultural research. Some sections of the open grassland appears to contain localised low mounding due to previous land use and also contains retaining structures along its boundary with the school grounds.

In the north-west corner of the site an existing irrigation dam covers an area of approximately 19,000 m². At the time of writing this report the water level in the dam was observed to be approximately 1 m below the surrounding ground surface. The dam was observed to have a minimum depth of water of approximately 1 m at the dam edge based upon visual observation.

No information was reviewed which indicates the maximum depth of the dam. An overflow structure feeding into Blind Creek is located on the north side of the dam. The land surrounding the dam appears relatively flat and low lying in nature indicating that it is part of the Blind Creek flood plain.

3.2 Site Geology

The Geological Survey of Victoria (1981), Ringwood Mapsheet, 1:63 360 Geological Map Series, indicates the surface geology at the site as follows:

- Humevale Formation (Dlh) – Early Devonian Siltstone: brown, laminated, with minor fine grained sandstone interbedded at top of formation.
- Quaternary Alluvium (Qra) – Recent Quaternary low level alluvium.

The Humevale Formation siltstone and minor sandstones is indicated to underlie the entire site extents but is covered with alluvium associated with Blind Creek towards the north of the site. The geological mapping indicates that the alluvium extends approximately 250 m from the creek. This distance is considered to be indicative only and the alluvial cover extent may be more or less than that indicated.

The geological map also indicates that the bedrock beneath the site may be located over a large scale fold in the rock known as a syncline. The bedding within the rock mass will dip (slope) towards the centre of this structure and possibly be more fractured towards its centre. Intrusive igneous dykes are documented to occur in the siltstone bedrock elsewhere in the region and are generally weathered to soil like materials in the shallow subsurface. The location of these structures is difficult to predict.

Reference should be made to the geology plan presented in Figure 1 of this report.

3.3 Historical Information on Subsurface Conditions

A search of available historical borehole data along with review of GHD's internal borehole database was conducted for the proposed site.

The only borehole information located within a relevant proximity to the site was historical data supplied by Melbourne Water. These borehole records indicate that the general subsurface profile comprises between 0.2 and 0.6 m of topsoil overlying stiff clays. Some isolated occurrences of firm clay soils were also recorded. Soft clay soils were identified in one borehole located adjacent to Blind Creek and in several boreholes located to the east of the site immediately to the north of Fairhills High School. It should be noted that whilst the soil indicates as being soft, no information is provided on how this strength was determined. No in-situ testing was recorded on the borehole logs.

Siltstone and sandstone bedrock beneath the soils was intercepted in boreholes at a depth of between 1.5 and 2.74 m to the west of the site and between 1.0 and 4.9 m below surface adjacent to Blind Creek.

The location of all relevant historical boreholes has been included within Figure 1 of this report.

GHD boreholes in the general area indicate a similar profile to that detailed in the Melbourne Water boreholes with the exception that no soft soils were encountered.

3.4 Groundwater

The Department of Environment, Land, Water and Planning (2015) Visualising Victoria's Groundwater database does not contain any historical groundwater bore information relevant to the site. The mapping available estimates that the depth to ground water should be expected to be in the region of 5 to 10 metres depth below surface level.

It should be expected that the groundwater level over the northern portion of the site may be shallower and influenced by the water level of the nearby creek level.

Groundwater levels in historical Melbourne Water borehole adjacent to the creek indicated groundwater levels of between 2 and 3 m below surface levels at the time of investigations. Boreholes located towards the east and south of the site did not encounter groundwater within 3.5 m of the surface. A borehole positioned towards the east of the site at the north eastern corner of Parkhurst Drive encountered groundwater from surface.

4. Discussion

4.1 General

It is currently understood that Development Victoria propose to develop the 609-621 Burwood Highway site to contain a mixture of commercial, medium density residential and low traditional density residential land.

The 'southern portion' of the site is expected to contain some mixed use land, with the 'northern portion' likely to contain medium density. The section of mixed use land is likely to contain commercial infrastructure along with medium density residential properties. Depending on the height of structures within the mixed use zone, it is possible that deep foundations (piled foundations) may be required, depending on the adopted design. Basement excavations associated with the structures may also be required.

The 'northern portion' of the site is expected to comprise medium density residential, typically founded on shallow foundations. It is also understood that earthworks may be required to reshape the existing irrigation dam into a feature wetland structure.

The discussions presented within this section are based on the available desktop information on the site, the features noted during walkover and GHD's understanding of the proposed development based on communications with Development Victoria.

4.2 Geotechnical Considerations for Design and Construction

4.2.1 Presence of Fill Material

During the site walkover it was noted that fill material is present at isolated locations across the site. Areas of filling can be typically attributed to site infrastructure (buildings, roads and retaining structures) and locations where the natural land has been profiled to accommodate the sloping nature of the site. The majority of existing infrastructure is concentrated to the southern portion of the site and along site boundaries (e.g. adjacent to school grounds).

Evidence of shallow filling was also noted at select areas across the northern portion of the site where the grassland/horticultural testing grounds are likely to have been cultivated or contain imported soil. This typically involves low mounding (0.5 to 1.0 m depth or less), however these may be deeper in sections where the ground profile has been partially levelled on the natural slope.

Where uncontrolled fill material is present on sites intended for residential or commercial use, this presents the risk of consolidation and differential settlements following development. This can lead to cost implications during design and construction due to the requirement for large volumes of imported fill construction and heavy engineering design for foundations, roads and utility services.

The depth of fill material will need to be determined through detailed geotechnical investigations (i.e. boreholes/test pits) to further inform the feasibility of land use and subsequent design. Although no information indicating the presence of areas of fill has been identified, there remains a possibility that some areas of buried waste associated with previous activities on the site may also exist. Any contamination assessment of the site may identify any such areas from historical aerial photographs.

4.2.2 Site Profile

The natural profile of the proposed development site typically slopes downhill to the north at a maximum gradient of approximately 1V:10H (i.e. sections of the grassland over northern portion of site).

During development, sections of the site will require cut/fill excavation to cater for the natural slope. The suitability of cut material for use as fill on site will need to be considered. It is recommended that intrusive investigation be undertaken to assess the suitability of the natural soil at the site for possible re-use as construction fill material.

4.2.3 Alluvial Material

As described previously, the site typically slopes downhill to the north, however it becomes relatively flat and low lying over an area of approximately 250 m prior to the northern boundary (towards Blind Creek). This low lying area accommodates the existing irrigation dam, which is proposed to be reshaped to extend further towards the north-east to Blind Creek, with traditional density land expected along the eastern boundary overlooking the wetland feature.

This area is likely to contain alluvial deposits associated with Blind Creek. The alluvial geology can present the following risks:

- Variable strength characteristics.
- Saturated conditions.
- Poor foundation/subgrade and excavation characteristics.

Intrusive geotechnical investigations should be completed to confirm the subsurface profile and soil strengths in this area and hence suitability for redevelopment.

4.2.4 Existing Dam Structure

The construction detail of the existing dam structure is unknown; however from visual inspection the dam appears to be clay lined. Geotechnical investigations will need to be undertaken for any expansion or filling works proposed for the existing dam.

The depth and suitability of available clay material will need to be determined where the dam expansion is required. Investigation of the soil classification and grading properties, permeability characteristics and dispersive potential of natural soils should be undertaken. The temporary and long term stability of embankments should also be considered.

Where filling of the dam for other use is considered, detailed investigations should be undertaken within the drained floor of the dam to assist in determination of the existing condition of material and determine the depth of soft soils below the dam.

4.2.5 Construction of Commercial Structures

It is understood that commercial structures proposed for the southern portion of the site may include buildings up to six to eight storeys in height. Structures of this type are likely to require deep foundations. Deep excavations for basements may also be required. The underlying siltstone geology is typically favourable for foundation design.

Any basement excavations should be supported with appropriately designed ground retention methods to prevent failure of the excavation faces. Ground support measures should also take into account potential toppling, wedge failure or planar failure along persistent defects in the siltstone bedrock.

The syncline geological structure indicated to be below the site on the geological map may increase the magnitude of fracturing and weathering in the rock requiring deeper foundations and increased ground support measures. Localised occurrences of weathered dyke rocks should also be assessed and accounted for in the design of foundations and excavation support.

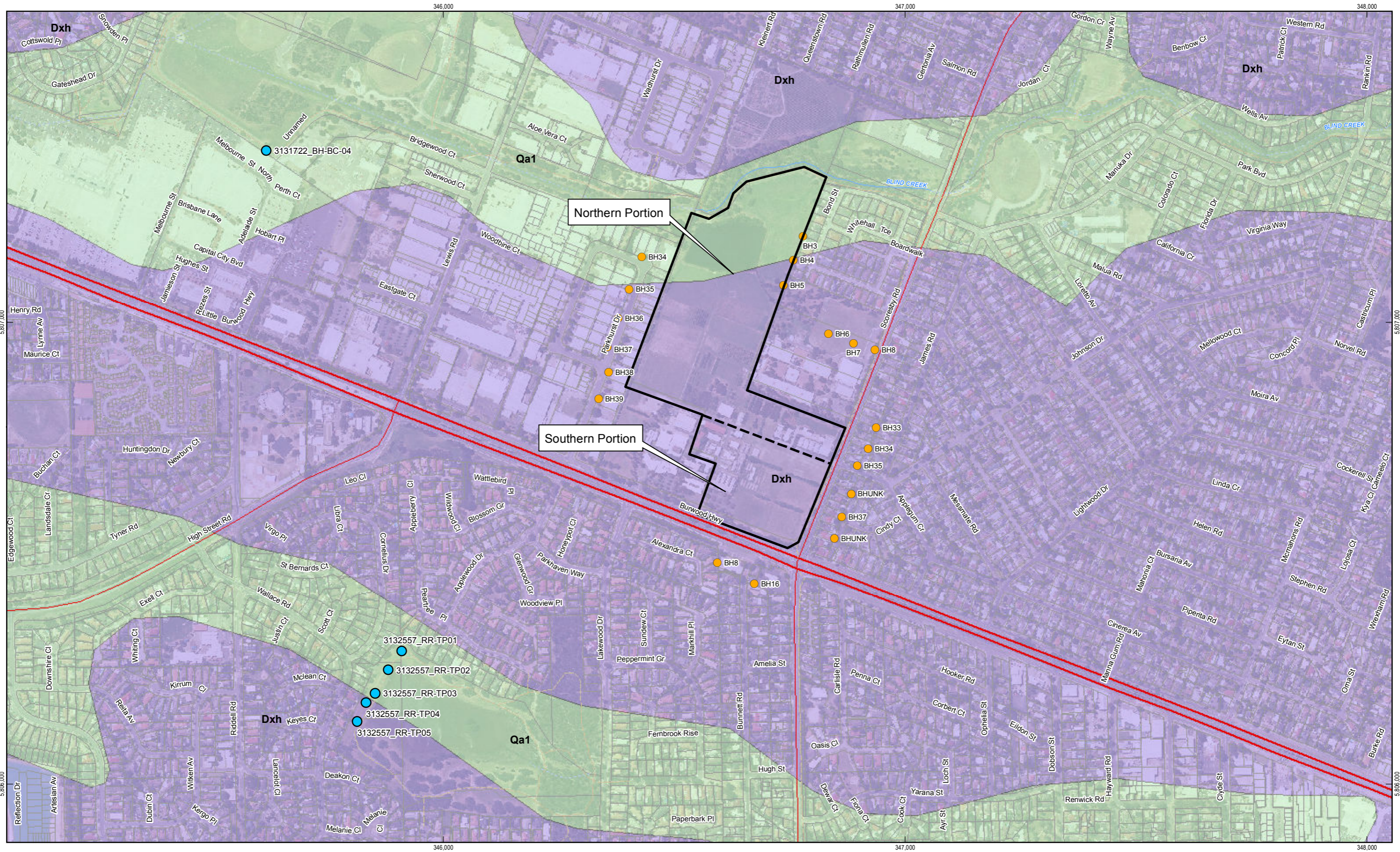
The existing site infrastructure typically contains single storey office buildings, sheds/hothouses and pavements, all of which are assumed to be founded on shallow foundations. Therefore there is presently limited available information on subsurface conditions at depth to inform the design of the larger structures described above.

Detailed geotechnical investigations will need to be carried out at the proposed location of such structures to inform the structural design requirements (i.e. foundation design, basement design). The depth of groundwater should also be determined over a period of year or more to determine the requirement for any excavation dewatering and basement waterproofing or pumping.

4.2.6 Contamination

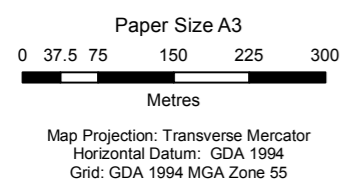
Based on the historical site use, areas of the proposed development may contain a risk of contamination within the upper soil profile. It is common for sites used for agricultural/horticultural purposes to have been exposed to imported chemicals (i.e. pesticides).

The presence of such contamination should be investigated via laboratory analysis of soils across the site. Contamination of soils can present significant cost risk during construction based on the disposal requirements outlined by the Environmental Protection Agency (EPA). It should also be noted that naturally occurring soil contamination can also present risks to site use. GHD has not completed an assessment of the available contamination testing results from a contamination assessment perspective.



Northern Portion

Southern Portion



LEGEND

Site Boundary	Geology Dxh, Humevale Siltstone (Dxh): generic
GHD Boreholes	Qa1, alluvium (Qa1): generic
MWC Boreholes	



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621 Burwood Highway Site

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Geology Plan

Figure 1



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