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GEOTECHNICAL, HYDROGEOLOGICAL AND CONTAMINATION ASSESSMENT

NORTHERN FURTHER INVESTIGATION AREA LOVELY BANKS, VICTORIA

PREPARED FOR LB REZONING PTY LTD C/O WILCON PROJECTS

Report Reference: G3154.3 AB

Date: 20 April 2017

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PROJECT DETAILS

Project Reference	G3154.3	Rev	AB
Project Title	Geotechnical / Hydrogeological / Contamination Assessment		
Project Location	Northern Further Investigation Area, Lovely Banks	State	VIC
Date	20 April 2017		

CLIENT DETAILS

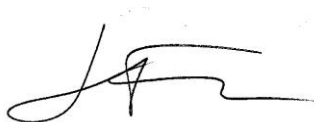
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DISTRIBUTION

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This document presents the results of the assessment conducted for the above project and is detailed for the sole use of the intended recipient. Should you have any questions related to this report please do not hesitate to contact the undersigned.

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EXECUTIVE SUMMARY

The Northern and Western FIAs were identified in the City of Greater Geelong (COGG) and Geelong Region Alliance *G21 Regional Growth Plan* (2013) as potential areas for future urban growth. The objectives of this assessment were to evaluate the feasibility and limitations of land development within the Study Area, with consideration of geotechnical, hydrogeological and environmental contamination risks. The findings and outcomes will contribute to the overall Framework Plan, which will inform potential future development within the Northern FIA.

A desktop study of anticipated site conditions and historical land use identified several areas of potential environmental concern, however no extremely sensitive environmental receptors were identified. The Lovely Banks Monocline and reactive residual basaltic clay soils were also identified as potential geotechnical risks for future development. Each potential risk area was highlighted for further consideration during a preliminary field investigation.

The field investigation comprised a walkover of the Study Area and an intrusive drilling investigation at 28 borehole locations to a maximum depth of 3.9m. Consideration was given to areas of significance indicated during the desktop study, access constraints, presence of significant ecological and heritage features, and potential locations of future infrastructure. Highly reactive basaltic clay soils were generally encountered throughout the Study Area, which transitioned to older Moorabool Sands Formation sediments in some locations, or were overlain by alluvial sediments in areas of deposition. Groundwater was not encountered during the investigation.

The results of preliminary laboratory physical and chemical analysis confirmed the highly reactive nature of clay soils but did not indicate any potential environmental risk or previous impact.

The recharge and discharge conditions of aquifer systems within the Study Area are not expected to be significantly influenced by typical commercial or residential development. The low permeability clay, shallow basalt and low yields associated with the local hydrogeological conditions may inhibit use of integrated Water Cycle Management (IWCM) features, such as soakage pits, however further analysis of any IWCM strategy should be undertaken.

Several sites within the Study Area were identified as presenting a High or Medium risk of potential contamination. The risk levels were assigned based on assumed development for sensitive land use, with High PFC risk sites requiring an Environmental Audit of land should and Medium PFC risk sites requiring environmental site assessment prior to future redevelopment. Further environmental investigation of the former airfield was recommended prior to redevelopment to confirmed the current conditions and inform Environmental Audit requirements.

Research of recent publications indicated the regional importance of the monocline feature within the NIA study area. Restriction of development to residential and rural developments or recreational areas has been recommended within the monocline based on its geoheritage and geoconservation significance to the area and the geographical boundary it creates.

Areas of landslide susceptibility, hazard and erosion were identified within the existing monocline physical escarpment feature within the study site. Based on visual and aerial interpretations of the existing escarpment in conjunction with the results of the boreholes, it is considered that majority of the escarpment area is considered as low susceptibility and hazard for small to large scale landslide to occur, and is generally considered to be in equilibrium with its current stress state. Localised areas of moderate landslide susceptibility and hazard were encountered, mainly within the existing ravines that dissect areas of the monocline. Different geological deposits

are also expected within these areas which may influence the susceptibility of the landscape to erosion or landslide potential.

Generally, the escarpment was considered to pose low hazard for the event of a landslide, with increased hazard observed within the localised ravines. Development within the escarpment area is likely to alter the existing stress regime which may result in an increased rate of erosion and landslide susceptibility. Consideration needs to be given to these area with restriction to development or further investigation and modelling works required.

Consideration was given to existing rock outcrops and the potential for rock fall within these areas. One area was observed within the northern section of the study area which was considered to be of low susceptibility and hazard.

Key surface and subsurface soil conditions included the presence of shallow basalt bedrock (inferred), basalt floaters, highly reactive soils and soils susceptible to erosion. The conditions are not generally considered to pose unacceptable risks for future development, however one or more will influence the design and construction methodologies of infrastructure (general) and must be considered on a site-specific basis for any future development.

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1. INTRODUCTION

Ground Science Pty Ltd (Ground Science) has prepared this report to present the findings of a geotechnical, hydrogeological and contamination assessment undertaken as part of the Northern and Western Geelong Growth Areas (NWGGA) Project.

This assessment relates specifically to the Northern Further Investigation Area (FIA), which is located north east of Geelong in Lovely Banks, Victoria and will herein be referred to as the 'Study Area'.

2. BACKGROUND AND OBJECTIVES

The Northern and Western FIAs were identified in the City of Greater Geelong (COGG) and Geelong Region Alliance *G21 Regional Growth Plan (2013)* as potential areas for future urban growth. Significant background information has been prepared to date, including strategic planning and technical studies. The current objective is to prepare a consolidated Framework Plan that COGG can reference and ultimately rely on.

The objectives for Ground Science's contribution to the Framework Plan is to evaluate the feasibility and limitations of land development within the Study Area, with consideration of geotechnical, hydrogeological and environmental contamination risks. This study has been undertaken in conjunction with studies of other disciplines including traffic & transport, flood/stormwater and ecology.

3. SCOPE OF WORK

The scope undertaken as part of the assessment was generally in line with the methodology suggested by the NWGGA Project *Technical Reports – Scopes of Work (2016)* document, and included:

- Review of relevant reports and existing work undertaken as part of the G21 Regional Growth Plan, with attendance at project inception and planning meetings;
- Completion of a desktop study to assess historical details and anticipated conditions within the Study Area. Results of the desktop study were used to inform the requirements for further investigation;
- A preliminary walkover throughout the Study Area to identify site geomorphology and determine access requirements for intrusive works;
- A field investigation, which included intrusive drilling at 28 borehole locations with the subsurface profile logged and samples collected for selective physical and chemical analysis;
- Interpretation of field and laboratory data;
- Preliminary risk assessments to inform the strategic planning of land within the Study Area; and
- Preparation of this report to address the key project outputs and inform the ultimate Framework Plan.

3.1 PROJECT LIMITATIONS

This assessment was undertaken as a feasibility study of typical conditions throughout the Study Area and is not intended to be a detailed characterisation of each site within the Northern FIA. Additionally, access for site inspections and intrusive works was limited to land owned by the Lovely Banks Ownership Consortium (is this right) and/or consenting private land owners.

This report does not provide site specific geotechnical or environmental advice for development and shall not be used for design purposes.

4. STUDY AREA DETAILS

The Study Area is generally bound by Staceys Road to the north, Anakie Road and Geelong Ring Road to the south, Bacchus Marsh Road to the east and Evans Road to the west.

The Study Area is shown in Figure 1, with further details provided in Table 1.

Table 1: Summary of Study Area Details

Municipality	City of Greater Geelong
Approximate area	2,100 hectare (ha)
Planning Zones	Urban Growth Zone (UGZ) Rural Living Zone (RLZ) Farming Zone (FZ) Public Use Zone – Service and Utility (PUZ1)
Planning Overlays	Environmental Significance Overlay (ESO4) Heritage Overlay (HO16 & HO1721) Vegetation protection overlay (VPO1)

4.1 CURRENT CONDITIONS

The Study Area is predominantly utilised for farming and agriculture, with a greater density of residential properties in the southern and south eastern areas. Significant features within the Study Area include:

- South West transmission gas pipeline, which intersects the Study Area within a 20m easement;
- Lara Energetic Materials Manufacturing Plant (LEMMP) industry buffer (1km) in the north west; and
- Geelong Ring Road Employment Precinct (GREP) industry buffer (1km) in the south east.

Additional features to the above that have been identified by COGG as exclusions from the likely developable land area considerations include the Barwon Water ‘Lovely Banks Basins’ water storage reservoir, the Geelong Baptist College and the BP Service Station.

Note that this assessment aims to conduct an analysis of conditions throughout the entire Study Area without the above exclusions, which have been listed for reference only.

5. ENVIRONMENTAL SETTING

5.1 CLIMATE

Average monthly and annual rainfall data was obtained from the Australian Bureau of Meteorology (BoM) Lovely Banks (Reservoir) Climate Station. The mean annual rainfall from this station is 519mm per year. Monthly evaporation data obtained from Durdidwarrah Climate Station, which is the closest climate station to record pan evaporation, reports an annual evaporation of 1,009mm/year.

Table 2: Anticipated Climate Data

(mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Rainfall	32.7	37.1	37.0	42.7	44.6	43.6	42.6	45.0	50.5	52.7	48.1	42.3	519.0
Evaporation	155.0	134.4	102.3	60.0	40.3	24.0	43.4	46.5	60.0	93.0	111.0	139.5	1,009

Based on the available data summarised in Table 2, monthly rainfall within the Study Area significantly exceeds potential evaporation during June only. It is noted that based on the distance between the Study Area and the slight changes in landform, actual evaporation may differ slightly from the values adopted above.

5.2 TOPOGRAPHY/GEOMORPHOLOGY

An understanding of the geomorphology was undertaken with the use of available aerial imagery, local elevation profiles and available topographic details. In general, the central and western portion of the Study Area typically comprises of relatively levelled ground with slopes ranging from 0.0% to 1.0% over a distance of up to 4km (east/west) and 5km (north/south). These areas are generally occupied by open paddocks and farm lands.

The eastern portion of the Study Area is located over relatively variable topography with elevated surface landforms corresponding mainly to the existing Lovely Banks Monocline, situated within the eastern portion of the Study Area; running north east to south central. Average slopes of between 3% to 15% are expected within these areas over a shorter length of between 1km to 1.5km. These areas, as well as the southern portion of the Study Area, are generally noted to be densely populated with a higher concentration of residential, agricultural and industrial parcels of land.

The surface elevation of the Study Area is noted to vary from approximately 75m to 90m (west), 20m to 30m (east), 25m to 35m (south) and 75m to 90m (north) when assessed over a broad range.

5.3 GEOLOGY

5.3.1 Regional

The western volcanic plains of Victoria can be generally categorised into two main geological features, including undifferentiated quaternary sediments and Newer Volcanics of the Holocene and Pleistocene periods. An understanding of the regional geological conditions was undertaken through review of the Geological Survey of Victoria, Geelong map sheet (scale 1: 63,360), which indicates the Study Area is located predominantly over Quaternary aged Newer Volcanic deposits, as expected within the western and south western region of Victoria. Tertiary aged Moorabool Viaduct Sands and Fyansford Formation deposits are expected near the east-central and north eastern sections of the Study Area.

The Lovely Banks Monocline has been also identified as a key geological feature within the Study Area which is to be incorporated into the field and final report phase of this study. The Lovely Banks Monocline can be generally identified as 'younger' movement potentially during the Pliocene to Quaternary age.

Figure 2 provides a visual representation of the anticipated geological conditions of the Study Area.

5.3.2 Anticipated Local Soils

The above regional geological conditions are assessed on a broad scale with the aim to further understand soil characteristics of each distinguishable geological deposit and the integration and contact points between each geological unit. In such areas, generally variable soil deposits and soil characteristics can be expected.

Soils derived from Quaternary Newer Volcanic deposits can generally be expected to be comprised of residual clays, silty clays, clays with variable sand content and clays with variable silt content. Residual basalt clays are generally highly to extremely reactive and subject to shrinking/swelling with naturally occurring seasonal changes. Extremely weathered basalt can often be recovered as a clayey silt, silty clay or sandy clay with varying gravel content. Basalt bedrock is typically found at shallow depths within the western region of Victoria however is highly influenced by surface elevation, the presence of water bodies and naturally occurring landforms. The presence of boulders is common within these deposits.

Soils derived from Tertiary aged deposits are generally expected to comprise of sands, sandy clays, clayey sands and sands with varying silt and clay content. Typically, these soils are expected to be variable, particularly at the contact points between the geological units.

5.4 ACID SULPHATE SOILS

Information presented by the Victorian Department of Primary Industries (DPI) indicates the Study Area exists outside areas that have the potential to contain acid sulphate soils as indicated by geomorphology.

5.5 HYDROLOGY

A review of the Department of Environment and Primary Industries (DEPI) Victorian Water Resources online mapping database identified several unnamed streams and minor dams within the Study Area, which are expected to provide seasonal drainage or temporary storage.

The nearest significant surface water features include Cowies Creek and the Moorabool River to the south west and Elcho Drain to the east. Port Phillip Bay is located approximately 3.5km south east of the Study Area and must be considered as a potential downstream receptor.

5.6 HYDROGEOLOGY

5.6.1 Regional Expectations

The Department of Sustainability and Environment (DSE) identifies the Study Area as located within the Port Phillip Basin for regional groundwater management. Further delineation of the basin by the relevant rural water authority (Southern Rural Water) identifies the Study Area as located within the West Port Phillip Bay Groundwater Catchment but outside all declared Groundwater Management Areas (GMAs), Water Supply Protection Areas (WSPAs) and Surface Water Management Areas (SWMAs).

The primary hydrogeological units identified within the West Port Phillip Bay Groundwater Catchment, which may be encountered beneath the Study Area include:

- Newer Volcanics – The uppermost aquifer across the Study Area is expected to exist as a fractured rock aquifer within Quaternary aged Newer Volcanics basalt. The hydrogeological characteristics of the aquifer are expected to be variable and dependant on the presence, frequency and weathering of fractures and may have multiple zones separated by clay layers.
- Moorabool Viaduct Formation – The Upper Tertiary aquifer is expected to exist within Moorabool Viaduct Formation sand, which generally underlies Newer Volcanics basalt but may outcrop in the eastern area of the NIA. The aquifer is generally less than 30m thick, confined where overlain by basalt and occurs in sands, gravels
- Middle to lower Tertiary units – Underlying the upper aquifers within the Study Area may be an aquitard within the Fyansford Formation (Batesford or Torquay Group Limestones) or the lower Tertiary Werribee Formation aquifer, however these units are not expected to outcrop or significantly influence the uppermost hydrogeological conditions.

The Department of Natural Resources and Environment (DNRE) Victorian Groundwater Beneficial Map Series indicates groundwater within the Upper Tertiary aquifer system within the Study Area may be representative of Segment B quality (1,000-3,500mg/L total dissolved solids [TDS]). The State Environmental Protection Policy (SEPP) (*Groundwaters of Victoria*) (1997) requires the protection of maintenance of ecosystems, primary contact recreation, potable mineral water supply, irrigation (agriculture), stock watering, industrial water use and protection of buildings and structures as beneficial uses of groundwater for Segment B quality.

These beneficial uses of groundwater may not all be realised based on the likely land use and aquifer yields, however each must be considered until actual groundwater conditions are confirmed.

5.6.2 Study Area Hydrogeology

The Visualising Victoria's Groundwater (VVG) website maintains a database of groundwater bores registered by the DEPI across Victoria. A search of the database was undertaken, with a summary of available details for registered groundwater bores provided in Table 3.

The available bore information supports regional expectations of an uppermost aquifer unit within Newer Volcanics basalt. Bore construction details indicate that the unit is up to 30m thick and multiple aquifer zones may exist at depths from 5-30mbg. A maximum yield of 3.1L/sec and TDS values between 5,980-9,612mg/L (Segment C quality) were reported. Bore construction details also indicate that an aquifer unit within the Moorabool Viaduct Formation sands exists between approximately 20-50mbg, which is generally overlain by Newer Volcanics basalt. A maximum yield of 1.5L/sec was reported.

It is noted that none of the bores were registered for potable water supply. Additionally, Southern Rural Water have no licenses currently issued for extraction, management or trading of groundwater within the Study Area.

Table 3: Groundwater Bore Information

Bores within the Study Area

Bore ID	Location	Use	Completion Date	Total Depth (m)	Screened Interval (m)	Aquifer Unit
142211	665 Bacchus Marsh Rd	Domestic	5 Feb 2005	48.0	41.0-48.0	Sand
81396	260 Elcho Rd	-	18 May 1971	21.9	-	Basalt
81413	595 Bacchus Marsh Rd	Domestic	25 Sep 1986	72.3	65.2-71.2	Granite
81409	25 Houston Rd	Domestic/Stock	8 Dec 1986	24.3	17.0-24.3	Basalt
81405	380 Heales Rd	Domestic/Stock	10 Nov 1982	24.0	5.3-24.0	Basalt
142104	35 Frys Rd	Domestic/Stock	11 Jan 2000	54.0	48.0-54.0	Gravel
81392	365 Emmersons Rd	Groundwater investigation	31 Dec 1964	167.0	Approx 85.0	Limestone

Bores outside the Study Area

Bore ID	Location	Use	Completion Date	Total Depth	Screened Depth	Aquifer Unit
109366	275 Staceys Rd	Domestic	20 Apr 1991	43.0	-	Basalt
109365	275 Staceys Rd	Domestic	1 Apr 1991	45.0	-	Basalt
142006	295 Patullos Rd	Domestic	3 Oct 1999	34.5	22.5-34.5	Sand
141852	670 Bacchus Marsh Rd	Domestic	5 Dec 1998	46.5	37.5-46.5	Sand
144735	660 Bacchus Marsh Rd	Domestic	27 Sep 2001	61.0	39.0-61.0	Limestone and Sand
WRK985517	600 Bacchus Marsh Rd	-	-	150.0	-	-
81408	Elcho Reserve	Domestic/Stock	30 Mar 85	36.0	24.0-28.0	Basalt
75265	295 Heales Rd	Domestic/Stock	1 Mar 1990	30.5	25.0-30.5	Basalt
WRK046894	340 Bacchus Marsh Rd	Domestic/Stock	11 Jan 2007	19.0	0.5-17.0	Basalt
WRK039203	245 Bacchus Marsh Rd	Industrial	24 Jan 1983	18.0	12.0-18.0	Basalt and Clay
142097	245 Bacchus Marsh Rd	Domestic/Stock	8 Jan 2000	48.0	42.0-48.0	Sand

6. HISTORICAL USE AND POTENTIAL FOR CONTAMINATION

Based on the objectives of the assessment and the planning stage of the development, a preliminary historical review of the Study Area and its surrounds was completed.

6.1 REVIEW OF TITLE INFORMATION

Review of certificate of title information was retrieved from Land Victoria, Victorian Department of Sustainability and Environment to provide information relating to current and historic site ownership. Due to the size and number of separate properties within the Study Area, a preliminary search of title information was conducted to provide detail on earliest titles for a centralised location as well as several targeted sites.

The search indicated that the central section of the Study Area has been historically used for farming activities and was subject to be utilised for mining purposes under the Land Act 1928. No registered details of mining operations were listed.

The Barwon Water 'Lovely Banks Basins' facility has had no previous recorded title ownership or dealings and has existed since prior to 1928. No indications of potentially contaminating land uses were detailed in the records obtained.

Copies of the historical certificate of title searches have been included in Appendix A, with a summary table presented for reference.

6.2 REVIEW OF AERIAL PHOTOGRAPHS

Aerial imagery obtained from the Department of Land and Property Information as well as online imagery databases (Google Earth, Nearmap) were reviewed as part of the historical search.

Review of aerial imagery from between 1947-2016 provided no evidence of mining, significant landfilling or heavy industry activity within the Study Area. Several more localised potential sources of contamination were identified, including a former airfield and several current horticultural operations (market gardens) or orchards which may be further assessed during the field investigation.

A copy of the reviewed imagery is presented in Appendix B with an additional table summarising observations.

6.3 SEARCH OF PUBLIC RECORDS

A search of EPA Victoria public records was undertaken to identify potential sources of contamination at or in the vicinity of the Study Area. The search results are summarised in Table 4.

Table 4: Public Records Search

Register	Description	Outcome	Comments
Priority Sites Register	Sites for which the EPA has issued a clean up or pollution abatement notice	225 Staceys Road, Lovely Banks (onsite)	Listed as a site where industrial waste has been dumped. Will be further detailed in Section 6.4
		83 Purnell Road, Corio (2km east)	Current service station requiring ongoing management. Unlikely to directly affect conditions within the Study Area
Environmental Audit sites	Sites where a Certificate or Statement of Environmental Audit has been issued	391-395 Princes Hwy, Corio (2km east/south east)	Former service station with residual hydrocarbon impact in soils (>3m) and groundwater (Moorabool Viaduct sands). Statement of Environmental Audit issued with some beneficial uses of groundwater precluded
		14-24 Thrush Street, Norlane (2km south east)	Former school to be potentially developed as an aged care facility. Statement of Environmental Audit issued due to potential for asbestos material
EPA licenses	List of facilities operating under EPA licenses (e.g. waste discharge)	2/140 Broderick Road, Corio (2km east)	The license allows for discharges to air from a facility which stores and treats clinical and relates wastes. Not expected to significantly affect air quality within the Study Area due to predominant NW wind direction of the area
Map of GQRUZ sites	Map of groundwater quality restricted use zones, based on historical pollution	391-395 Princes Hwy, Corio	Groundwater restricted use zone due to hydrocarbon impact. The zone extends slightly south east and is unlikely to influence groundwater within the Study Area

The registered or documented EPA sites listed in Table 6, with the exception of 225 Staceys Road, are not considered to present a significant risk of impacting environmental conditions within the Study Area due to their locations and consideration of the anticipated eastern groundwater flow directions and NW wind direction.

A review of the GeoVic online mapping database identified no current or historical (circa 1860s-1966) mining, extraction or resource licenses within the Study Area or the in the vicinity.

6.4 REVIEW OF EXISTING DOCUMENTATION

Geelong Region Alliance G21 Regional Growth Plan – Implementation Plan Background Report (2013)

The G21 Regional Growth Plan provided the framework against which to plan for the two potential growth areas (FIAs). The report summarised a preliminary analysis of several land capability, planning, accessibility and deliverability considerations.

With consideration of land contamination, no evidence of any recorded or known landfill sites within the Study Area was reported. It was noted that the potential for landfill and/or waste disposal does exist but no identifiable sources of potential contamination were found to affect the Northern FIA.

With consideration of geotechnical detail and land stability, the Lovely Banks Monocline was recognised as a significant landform with concern raised over potential instability issues and the need for rezoning or specific zoning of some areas under an Erosion Management Overlay. Development within this zone at this point may be limited subject to an assessment of the geological and geomorphologic conditions of the monocline.

GHD Victorian Civil and Administrative Tribunal (VCAT) – *Expert Witness Statements* (2016)

A review of information released as part of a VCAT proceeding related to 225 Staceys Road, Lovely Banks was undertaken to provide detail regarding the environmental condition of that site and the potential for offsite impact.

GHD was engaged on behalf of the site Owner to assess the potential for proposed site operations to impact soil and groundwater quality, in particular whether the site can be returned to a condition suitable for its former use (agricultural) and whether the proposed use will impact surrounding land. Relevant information obtained from a review of the Statement included:

- The surface geological formation at the site is Quaternary aged 'Newer Volcanics' basalt, which was encountered between 0.7-1.2mbg at three borehole locations across the site;
- Groundwater at the site is expected to exist in a fractured rock aquifer within Newer Volcanics basalt. A deeper aquifer unit is expected to occur within the Moorabool Viaduct sands, based on registered bore details from a property adjacent to the west;
- Storage of uncontrolled fill and aluminium oxide containing material was occurring at the site. The aluminium oxide product was stated to not constitute prescribed industrial waste (PIW) but did contain heavy metal concentrations in excess of the relevant human health and ecological guidelines;
- Storage of the product did present a risk of impact to underlying soils through leaching, however suitable management techniques were possible to reduce risk; and
- Groundwater modelling indicated the site activities presented a low risk of impact to groundwater conditions at the site and that any impacts to offsite groundwater would be unlikely to compromise future development surrounding the site.

GHD was also engaged Owner to assess the potential for proposed site operations to cause unacceptable air, dust or odour emissions. Relevant information obtained from a review of the Statement included:

- Dust modelling reported limited impact beyond the site boundary;
- Odour emissions were considered negligible to non-existent; and

Air emissions were reported to not unreasonably impact the amenity of adjoining or surrounding land by residual industrial air emissions and any required buffer would fall within the existing 1km LEMMP industry buffer.

7. SUMMARY OF POTENTIAL RISK AREAS

The Study Area desktop study and historical review indicated that the majority of the Study Area has been historically used for agricultural purposes or low density residential use. No potentially contaminating sources on a greater than site-specific scale were identified (i.e. historical mining, landfilling) and no extremely sensitive environmental receptors were identified (i.e. wetlands, waterways).

The following areas of potential environmental and geotechnical concern were identified during the desktop study.

- Barwon Water 'Lovely Banks Basins' water storage reservoir operating in the south western section of the Study Area since pre-1928 – unknown processes and potential hazardous materials present;
- Former airfield within the central Study Area – potential for bulk fuel storage;
- EPA Priority Site at 225 Staceys Road, Lovely Banks – waste storage;
- Operating BP service station in the southern Study Area – bulk fuel storage;
- Several market gardens and orchards – application of pesticides and herbicides;
- Farming and agricultural activities throughout the Study Area – potential pesticide application;
- The Lovely Banks Monocline, which intersects the eastern section of the Study Area and generally runs north-south – may be at risk of erosion with changes to the stress regime, surface conditions or drainage conditions where development occurs; and
- Presence of highly reactive residual basaltic clay soils – may impact the development of infrastructure.

These areas have been identified for further consideration during a field investigation and are discussed in the following Sections.

8. ASSESSMENT FRAMEWORK

8.1 CONTAMINATED LAND

Guidance regarding the identification of potentially contaminated land and recommendations for assessment within the planning system is outlined in the Department of Sustainability and Environment (DSE) *General Practice Note Potentially Contaminated Land* (2005). The Practice Note classifies potentially contaminating activities as having a high, medium or low potential to cause contamination of land and groundwater and recommends a suitable 'contamination assessment response' for the responsible planning authority.

For future strategic planning purposes, each property within the Study Area will be assigned a potential for contamination (PFC) – risk level. Risk levels will be developed based on guidance within DSE (2005) and the results of this investigation, with assigned risk levels relating to the potential for contamination only – not an estimate of direct human health or environmental exposure risks. Future sensitive land use (typical residential with potential for child care and school zones) has been conservatively assumed for the entire Study Area, based on guidance from the COGG.

Table 5 summarises the rationale for each risk level and recommended level of further investigation.

Table 5: Risk Level Matrix

PFC Risk Level	Rationale	Recommended Further Investigation
High	Current or previous land use includes one or more land uses listed as High potential for contamination in Table 1 of DSE Practice Note (2005).	An Environmental Audit of land should be undertaken prior to development for any sensitive land use ¹ An Environmental Audit Overlay (EAO) may be applied to these sites or Ministerial Direction No. 1 may be sufficient where changes in zoning will be required.
Medium	Current or previous land use includes one or more land uses listed as Medium potential for contamination in Table 1 of DSE Practice Note (2005). Or a preliminary site investigation identifies conditions that may present potential contamination.	An environmental site assessment ² should be undertaken to determine whether the site is suitable for the proposed use or an Environmental Audit should be undertaken.
Low	No High or Medium potential for contamination land uses identified through site history studies or preliminary site investigation.	No further environmental investigation recommended. The site owner must still ensure general duties under the Planning and Environment Act (1987).

- Note that the relevant Planning Authority may apply for an exemption to this requirement in line with Ministerial Direction No.1
- May include a site-specific historical review, site inspection, intrusive soil investigation and/or groundwater investigation based on site conditions

Where sites require further investigation, the risk presented to human health or the environment is determined by assessing the reported levels of contaminants against the relevant recognised standards and guidelines, which are further detailed below. The guidelines are used for screening purposes only and may not trigger requirements for remediation or directly preclude beneficial uses of land.

The State Environment Protection Policy (SEPP) (Prevention and Management of Contaminated Land) details the beneficial uses of land which must be protected dependant on land use. Consideration of the entire Study Area as 'sensitive use - other' for the purposes of this assessment must ensure protection of the following beneficial uses of land.

- Modified and highly modified ecosystems;
- Human health;
- Buildings and structures;
- Aesthetics; and
- Production of food, flora and fibre.

The protection of ecosystems (modified and highly modified) and human health is considered with reference to National Environment Protection Council (NEPC) *National Environment Protection (Assessment of Contaminated Sites) Amendment Measure* (NEPM) (1999, as amended 2013). The NEPM consists of a policy framework for the assessment of site contamination and provides investigation levels for soil and groundwater.

8.2 HYDROGEOLOGICAL

The SEPP (*Groundwaters of Victoria*) (1970) outlines segments of the groundwater environment based on TDS values and specifies beneficial uses which must be protected for each of these segments. Without confirmation of TDS within the Study Area, each of the relevant beneficial uses of water should be considered.

To further ensure the protection of the quality of groundwater as both a resource and as part of the natural environment, EPA Victoria Publication 668 Hydrogeological Assessments (Groundwater Quality) Guidelines (2006) were developed. The guidelines describe the basics of groundwater contamination and the hydrogeological assessment process, including development of a conceptual model, collection of data and interpretation for suitable management recommendations.

8.3 GEOTECHNICAL

The geotechnical assessment was performed in consideration of the following key standards and guidelines, which are generally used to assist with development planning within Victoria:

- The Australian Standard AS 2870 *Residential Slabs and Footings* (2011), with reference to potential constructability issues that may be encountered with residential developments;
- Australian Standard AS 2159 *Piling – Design and Installation* (1995), which provides exposure classification values for concrete and steel piles in soil and should be considered during the design phase of potential developments;
- Australian Geomechanics Society *Journal and News of the Australian Geomechanics Society, Vol 42, No1, March 2007* (2007), with consideration of the guidelines for landslide susceptibility, hazard and risk zoning for land use planning;
- Austroads *Guide to Pavement Technology, Part 2* (2008), with consideration for potential development issues that may be encountered during pavement design;
- Australian Standard AS 3798 *Guideline on Earthworks for Residential and Commercial Developments* (2007), with consideration for potential earthworks and issues that may be encountered.

The abovementioned documents were used to assist in developing the methodology of the assessment and will likely form part of the framework of site specific investigations for future development. Additionally, the basic terms and descriptions in accordance with AGS for landslide assessment have been presented in Appendix C.

9. FIELD INVESTIGATION

The field investigation methodology and distribution of test locations was developed based on the conditions observed during an initial Study Area walkover. The proposed methodology was submitted to all relevant stakeholders for review prior to works, with the final borehole locations presented in Figure 3.

A total of 28 boreholes were advanced to assess the anticipated environmental and geotechnical conditions across the proposed investigation area, targeting areas of significance indicated during the desktop study. Consideration was given to the sampling density requirements detailed in the project brief, access constraints, presence of significant ecological and heritage features, and potential locations of future infrastructure.

9.1 INSPECTION OF PFC RISK AREAS

An inspection of the Barwon Water Lovely Banks Basins facility on 17 November 2016 was undertaken to further assess the potential for contamination at the site. The facility consisted of three operating and one former water storage basins, several small storage sheds and associated pumping and drainage infrastructure. Most storage basin structures were expected to have been developed using excavated soils (limited imported fill used) and all structures/activities were associated with water storage only, no water treatment infrastructure was observed. Some potential for hazardous building materials may exist due to their age but were none were observed.

An inspection of the property with visible remaining runway features on 3 October 2016 was undertaken to further assess the potential for contamination from previous operation of the airfield. No indications of bulk fuel storage, associated infrastructure or other potential signs of contamination were observed. Aerial imagery suggests former airfield buildings were located in the proximity of Blueview Place and 8-18 & 20 Viewhill Road – locations which have been recently subdivided and some redeveloped.

No access was available to inspect the operating market garden or orchard sites or the EPA Priority Site on Staceys Road. No indications of offsite migration of potential contaminants were observed in properties adjacent to these sites.

Site conditions encountered throughout the remainder of the Study Area was generally agricultural land (grazing and/or cultivation for hay and grain) or low density residential. Two properties were observed as potentially contaminating, based on the presence of waste metals (270 Elcho Road) and/or vehicle, caravan and boat storage (455 Bacchus Marsh Road). Each site couldn't be accessed and was observed from the fence line only.

9.2 SURFACE CONDITIONS

The Study Area covers approximately 2,100 ha of land and was observed to generally comprise of level land within the central, southern and western portion of the Study Area. Typically, geomorphic features were limited within these areas due to the level landscape observed and lack of natural processes occurring on the level land. Basalt float boulders and man-made basalt rock stockpiles were observed within the rural allotments within the western and central portion of the site. The eastern, north and south eastern section of the Study Area was observed to comprise of sloping land, generally dipping down to the east along the eastern flank of the existing monocline. The monocline was generally observed to strike north to south. Isolated tributaries/water pathways were observed dissecting the existing monocline where localised ravines/gullies had formed due to the process of weathering of weak zones of the surface. The ravines/gullies were generally observed to strike west to east, with embankments dipping generally north and south. The land was generally observed to become level at the toe of the existing monocline where residential housing was observed and geomorphic features less apparent.

Existing residential development was prominent and observed mainly to the south and within the eastern section of the Study Area at the toe of the existing monocline. The central and western sections of the Study Area were generally observed to comprise of rural allotments with occasional dwellings.

Vegetation was observed to generally consist of grassed paddocks and agricultural crops within the rural allotments with small to large trees noted within the properties. A detailed review of vegetation has been undertaken as part of the ecological investigation (by others) for the Northern FIA.

A photographic log of site conditions, significant features and borehole locations is presented in Appendix D.

9.2.1 Soil Salinity

No significant field indicators of soil salinity were observed during the field investigation, which may typically include bare soils, mineral (including salts) formation on surfaces, and low and/or flat topographic conditions.

Vegetation was observed to generally consist of grasses and small shrubs, becoming slightly denser within drainage features. The consistent growth of similar grass species across the Study Area, rather than confined to potential recharge areas, indicates growth is unlikely to be significantly influenced by soil salinity. Note that a detailed survey of the extent and type of vegetation species was not conducted as part of this investigation.

9.2.2 Acid Sulfate Soils

No field indicators of actual or potential acid sulphate soils were observed during the field investigation, which may typically include bare soils, mangrove/swamp/estuarine areas, corroded structures, jarosite or iron oxide occurrence in soils, odourous soils (sulfur), and/or surface water indicators.

9.3 SUBSURFACE CONDITIONS

The subsurface conditions encountered within the boreholes are presented in the engineering logs in Appendix E. The main soil groups encountered during the investigation are summarised below and in Table 7.

Group 1 – Inferred Quaternary Age Newer Volcanics residual basaltic clay

Group 1 inferred quaternary Age 'Newer Volcanics' residual basaltic clays were observed to generally comprise of brown medium to high plastic clays and silty clays generally observed to be stiff to hard. It should be noted that the clays were observed to range in plasticity with some areas observed to comprise of low plasticity. It is considered that weathered rock of the Newer Volcanics was encountered where gravel and sand were recovered from the boreholes prior to refusal.

These residual clays were generally observed across the majority of the site. Penetration refusal was encountered within some of the boreholes performed within these deposits. It is considered that penetration refusal may be encountered within basalt bedrock or basalt boulders which are common within these deposits. Some of the boreholes were observed to transition from Group 1 clays into Group 2 Moorabool Group deposits.

Group 2 – Inferred Tertiary Age Moorabool Viaduct Sand

Group 2 inferred Tertiary Age 'Moorabool Viaduct Sand' deposits were generally observed to comprise of brown/grey, sandy gravel, gravelly sand and sandy clay, fine to coarse, low to medium plasticity and generally observed to be dense to very dense. Where encountered, these deposits were generally observed below the Group 1 clay or as the surficial soils within sections of the monocline as a result of tectonic processes.

The inferred Moorabool Viaduct Sand were generally observed within BH11, BH13, BH16, BH17, BH21, BH22 and BH24 located within the slope and toe of the monocline between Elcho Road in the north and the Geelong Ring Road to the south.

Group 3 – Alluvial Deposits/Uncontrolled Fill and Topsoil

Group 3 identifies alluvial, uncontrolled fill and topsoil materials encountered within the Study Area. Inferred alluvial deposits were encountered during the investigation and were generally observed to comprise of dark brown to brown silty clay and clayey silt, low to medium plasticity and stiff in consistency. Alluvial soils are

generally considered to be common with deposition zones adjacent or at the base of water bodies or depositions zones at the toe of existing slopes.

Uncontrolled fill was observed within BH2 and BH30. BH2 was completed within an old farm access track that encountered uncontrolled fill generally comprising of brown mottled grey and white silty clay, low to medium plasticity and generally observed to be stiff to very stiff. BH30 was drilled within the vicinity of an old sealed road and generally comprised of dark brown silty clay, medium to high plasticity and generally observed to be stiff. It is considered that fill is likely to be encountered within the Study Area where human land practices have taken place in the past. Fill is considered likely to be encountered within backfilled dams, farms where materials have been buried, development sites where excess fill materials have been disposed and areas of infrastructure.

Topsoil was generally observed to comprise of brown/grey clayey silt, low plasticity and observed to be firm to stiff. Table 6 details the subsurface profile encountered, with borehole depths represented in Figure 4.

Table 6: Summary of Subsurface Soil Profile

Borehole	Group 1 depth (m)	Group 2 depth (m)	Group 3 depth (m)	Termination (T) or Refusal (R) depth (m)
BH1	0.0-0.1	-	-	0.1 R
BH2	0.5-1.05	-	0.0-0.5	1.05 R
BH3	1.5-2.2	-	0.0-1.5	2.2 R
BH4	0.0-1.1	-	-	1.1 R
BH5	0.0-3.9	-	-	3.9 R
BH6	0.15-0.4	-	0.0-0.15	0.4 R
BH7	0.1-0.5	-	0.0-0.1	0.5 R
BH8	0.0-0.55	-	-	0.55 R
BH9	0.0-1.2	-	-	1.2 R
BH10	0.2-2.7	-	0.0-0.2	2.7 T
BH11	-	0.0-1.2	-	1.2 R
BH11A	0.2-2.0	-	0.0-0.2	2.0 T
BH12	1.2-2.8	-	0.0-1.2	2.8 R
BH13	0.0-0.9	0.9-3.1	-	3.1 T
BH14	0.0-2.5	-	-	2.5 R
BH15	0.0-0.9	-	-	0.9 R
BH16	0.35-1.6	1.6-3.0	0.0-0.35	3.0 T
BH17	0.0-2.0	2.0-2.6	-	2.6 R
BH18	0.0-1.3	-	-	1.3 R
BH19	0.0-0.6	-	-	0.6 R
BH20	0.1-1.0	-	0.0-0.1	1.0 R
BH21	0.0-2.6	2.6-3.5	-	3.5 T
BH22	0.15-0.9	0.9-2.7	0.0-0.15	2.7 T
BH24	-	0.0-1.3	-	1.3 R
BH25	0.2-1.0	-	0.0-0.2	1.0 R
BH27	0.0-1.4	-	-	1.4 R
BH28	0.15-3.0	-	0.0-0.15	3.0 T
BH30	-	1.0-1.7	0.0-1.0	1.7 R

Groundwater was not encountered at any borehole locations assessed during the field investigation. This supports the desktop assumptions of groundwater existing at depths greater than 5mbg and not occurring as a significant recharge or discharge feature within the Study Area.

9.4 LABORATORY RESULTS

Samples were collected for physical and chemical analysis to validate desktop assumptions and field observations.

9.4.1 Physical Analysis

Field testing of soils for pH and electrical conductivity (EC) was conducted to provide additional data regarding the potential for highly saline or acid sulphate soils. Laboratory testing was conducted on soil samples retrieved from the subsurface soil profile to assess the general characteristics and properties for geotechnical assessment.

Details of physical testing and laboratory analysis are presented in Table 7.

Table 7: Physical Analysis Summary

Sample	Borehole	Depth (m)	pH	EC (dS/m)	Liquid Limit (%)	Plasticity Index (%)	Moisture Content (%)
#3	BH4	0.25-0.5	-	-	90	62	27.3
#4	BH3	0.2-0.5	-	-	69	43	26.4
#6	BH13	0.4-0.7	8.87	0.72	-	-	-
#8	BH30	0.1-0.4	9.73	0.46	-	-	-
#9	BH14	0.4-0.8	-	-	114	90	43.8
#10	BH21	2.6-3.0	9.85	0.54	-	-	-
#11	BH22	0.5-0.8	9.49	0.70	-	-	-
#12	BH17	0.2-0.6	8.66	0.11	-	-	-
#13	BH12	0.4-0.8	-	-	30	16	19.4

Preliminary results indicated slightly alkaline soil pH conditions and slightly saline EC concentrations. The results demonstrate a low likelihood of unacceptable soil salinity and/or potential acid sulfate soils. The reported pH values also indicate a low risk of soil aggressiveness on structures. No sodicity or detailed chemical analysis was undertaken due to the acceptable soil conditions observed.

The results have indicated variable conditions for the laboratory tests conducted, ranging from low liquid limits (indicative of low plasticity/reactivity) and high liquid limits (indicative of high plasticity/reactivity). The results of the laboratory tests generally correlate to the results of the borehole logs. The residual basaltic clays have indicated high liquid limits and are considered to comprise of highly reactive subgrades that may be sensitive to changes in moisture. The alluvial soils have generally indicated low to medium liquid limits. The reactivity of the subgrade within these materials are generally considered to be low to medium, however it should be noted that the plasticity/reactivity of the alluvial deposits may be highly dependent on the parent bedrock or residual soils from which they have been derived.

The results of the laboratory tests can be observed within Appendix F of this report.

9.4.2 Chemical Analysis

Due to the low likelihood of volatile contaminants identified during the desktop review and indicated by field observations, field screening for potential volatiles was not undertaken. No odour, staining or other indications of potential contamination were noted during the field program to justify modification to laboratory analysis.

The laboratory schedule detailed in Table 8 was requested to provide a preliminary indication of background soil chemical conditions. Soil samples for chemical analysis were collected from shallow depths within several of the main geomorphological areas within the Study Area.

Table 8: Analytical Schedule

Location	Location	Sample	Analysis
Background conditions	North western Study Area in flat plains – historical agricultural use with overlying uncontrolled fill	BH2/2	NEPM 2013 screen including heavy metals, organochlorine and organophosphate pesticides (OCP/OPP), phenolic compounds, petroleum hydrocarbons (TPH/TRH/PAH and BTEX)
	Within a gully formation intersecting the monocline – alluvial sediments	BH16/1	Heavy metals
	Down-gradient of the monocline in the south eastern Study Area – adjacent to intensive horticultural site in a potentially modified area	BH28/1	Heavy metals and OCP/OPP

Results of laboratory analysis reported concentrations of all organic compounds, including pesticides and hydrocarbons, below the laboratory limit of reporting (LOR). A copy of the laboratory report is presented in Appendix G.

All concentrations of inorganic heavy metals were reported below the adopted NEPM (2013) human health guidelines for sensitive land use (HIL A). Concentrations of manganese in one sample (BH16/1) and vanadium in all samples were reported in excess of the NEPM (1999) interim urban ecological investigation levels (EILs). These guidelines levels are only used as initial screening levels in the absence of site-specific data and it is noted that all reported concentrations are within the NEPM (1999) background ranges for natural soil conditions.

These elevated concentrations are expected to be representative of naturally occurring conditions within the Study Area rather than anthropogenic contamination as manganese and vanadium are commonly found in soils formed by the weathering of basalt rock. However, further site-specific assessment may be required to confirm baseline soil conditions.

10. ENVIRONMENTAL CONCEPTUAL MODEL

A preliminary environmental conceptual model has been prepared based on the results of the desktop review and field investigation. The model details the anticipated geological and hydrogeological systems within the Study Area as well as potential contamination sources, pathways and receptors.

10.1 STUDY AREA CONDITIONS

Table 9 summarises the environmental conditions within the Study Area and their potential influence.

Table 9: Study Area Conditions

Aspect	Occurrence	Impact on Environment
Geology	Newer Volcanics basalt across the central and western areas, overlying Moorabool Viaduct Sands in the eastern area	Basalt bedrock generally has low permeability unless weathered and may inhibit the vertical migration of contamination into groundwater
Soil	Heavy clays overlying weathered basalt, found to be very shallow in the western area and toward the peak of the monocline	Clay has low permeability and may inhibit migration of contamination, however preferential pathways may form during reactive processes. Weathering of shallow basalt may mobilise heavy metals within soil
Hydrogeology	Surface aquifer within fractured rock of Newer Volcanics basalt at depths >5mbg. Variable but limited yield anticipated	Low hydraulic conductivity may inhibit contaminant transport and limit available beneficial uses of groundwater within the Study Area
Sensitive features	No extremely sensitive features identified and no significant indications of salinity or acid sulfate soils observed	No unacceptable conditions identified

10.2 POTENTIAL SOURCES OF CONTAMINATION AND RECEPTOR PATHWAYS

Table 10 summarises the potential sources of contamination identified and the potential exposure pathways associated with each.

Table 10: Potential Sources of Contamination

Source	Potential Contamination	Potential Exposure Pathways
Historical agriculture	Presence of applied pesticides	Direct exposure to contaminated soil and impacts to sediment in surface waters via runoff
Lovely Banks Basins	Potential hazardous materials	Direct exposure to workers during operation/maintenance
Former airfield	Potential for previous bulk fuel storage	Direct exposure to contaminated soil and potential impacts to groundwater if significant release has occurred
Market gardens and orchards	Potential for application of pesticides and herbicides to impact land	Low runoff potential due to landform from market gardens. Direct exposure to contaminated soil may occur for any future redevelopment
EPA Priority Site	Listed as a site of industrial waste dumping/storage	Unlikely to present a risk of offsite contaminant migration due to soil and groundwater conditions and industry buffers. Exposure risk may change if redeveloped in the future.

The conceptual model should be refined to determine site-specific conditions for any environmental investigations undertaken as part of future development within the Northern FIA.

11. ENVIRONMENTAL RISK ASSESSMENT

The risk assessment process described in Section 8.1 was used to assign a PFC risk level for each property within the Study Area. Initial areas of potential contamination or environmental concern were identified during the review, with final PFC risk levels determined following site inspections and a preliminary soil investigation.

Table 11 summarises the sites assigned High or Medium PFC risk levels, with PFC risk levels for each site within the Study Area detailed in Figures 5 and 6.

Table 11: PFC Risk Assessment Summary

High Risk			
Site Number / Address	Land Use / Description	Potential Sources of Contamination	Comments
1 / 600-602 Anakie Road, Lovely Banks	Lovely Banks Basins – water storage reservoirs	Hazardous materials in buildings Potential uncontrolled fill material	Land use 'Utility depots' considered High PFC in line with DSE (2005) ¹
2 / 225 Staceys Road, Lovely Banks	Current material storage and recycling operation	Waste storage, specifically aluminium oxide containing material	EPA Clean-up notice issued for site. Land use considered High PFC in line with DSE (2005) ²
3 / 500 Geelong Ring Road, Lovely Banks	Current BP Service Station	Bulk fuel storage	Land use considered High PFC in line with DSE (2005) ³
Medium Risk			
4 / 350 Emmersons Road, Lovely Banks	Former airfield	Potential bulk fuel storage Uncontrolled fill for runway construction	Land use considered High PFC in line with DSE (2005), however further investigation recommended to confirm site extent and risk level
5 / 810-870 Anakie Road, Lovely Banks 6 / 20 Tillys Road, Lara 7 / 380 & 390 Heales Road, Lara	Market gardens	Application of pesticides and herbicides	Land use considered Medium PFC in line with DSE (2005) with no access available for inspections
8 / 350 Elcho Road, Lovely Banks	Extensive orchard in south west area of site	Application of pesticides and herbicides	Site use and potential for contamination similar to market gardens as per NSW EPA (2003)
9 / 24-29 & 30 Peart Court, Lovely Banks	Palm orchard and sales business	Application of pesticides and herbicides	Site use and potential for contamination similar to market gardens as per NSW EPA (2003)
10 / 270 Elcho Road, Lovely Banks	Large, derelict shed in western area	Heavy metals and hydrocarbons typically associated with scrap metals and waste storage	Based on recent aerial imagery and visual observation from fence line (no access available)
11 / 455 Bacchus Marsh Road, Lara	Caravan and boat storage property	Heavy metals and hydrocarbons associated with vehicle storage and potential fuel spills	Based on recent aerial imagery and visual observation from fence line (no access available)

1. May not require EAO due to planning preservation as Heritage feature
2. May not require EAO due to location within the LEMMP industry buffer
3. May not require EAO as Ministerial Direction No. 1 may be sufficient to ensure an Audit is undertaken

12. GEOTECHNICAL INTERPRETATION

During the desktop study, it was considered that the main geotechnical feature posing significant influence on the proposed feasibility study was the existing monocline, identified within the eastern section of the site. The following sections provide an insight to the key geotechnical considerations for the proposed future NIA development.

12.1.1 Regional Geology

Residual Basaltic clays were encountered within the majority of the boreholes performed and is considered to be the main geological unit across the Study Area. Secondly, and in the area of the Lovely Banks Monocline, Quaternary aged alluvial, colluvial and Tertiary aged Moorabool Viaduct Sand deposits are expected. The field findings were found to be generally in-line with the desktop and preliminary studies of the site.

12.1.2 Soil Reactivity & Site Classification

Soil reactivity is considered to be a key geotechnical consideration for developments within the study area and is likely to have an effect on key development factors such as the selection of footing systems, improvement/protection of pavement subgrades, thickness of pavement profiles and major earthworks.

Highly reactive residual basaltic clays are susceptible to changes in volume under variable moisture conditions and it is imperative that moisture ingress into these soils is considered and the appropriate measures put in place to mitigate such occurrences where development takes place. Exposed residual basaltic clays are prone to desiccation under dry (summer) conditions which can act for a conduit for water to penetrate lower lying soil layers. Under wet (winter) conditions, swelling and associated softening and trafficability issues may occur.

Where residential and commercial infrastructure is considered, footings are likely required to be engineered to facilitate higher characteristic surface movements, similar to Class H1, Class H2 and Class E sites as detailed in AS2870 (2011). The study area is located within a climatic zone of 3 (as shown on Figure D1 in AS2870) and the resulting site classifications are influenced mainly by the depth of continuous bedrock present within any subject site, as well as the thickness of the reactive clay layers available.

The field investigation, whilst limited, has shown the potential for bedrock to vary across developments. The depth of bedrock is likely to influence the resulting site classifications for individual sites, which would warrant further site specific testing to be undertaken. As an informative guide to the reader, site classifications using soil profile identification methods will depend mainly on the depth of continuous bedrock, as detailed below:

- $\leq 0.6\text{m}$ depth of clay over continuous bedrock: Class M – Class H1;
- $> 0.6\text{m}$ to $\leq 1.5\text{m}$ depth of clay over continuous bedrock: Class M – Class H2;
- $> 1.5\text{m}$ depth of clay over continuous bedrock: Class H2 – Class E.

The above guide to site classifications using soil profile identification methods shall be supported by appropriate laboratory tests including shrink/swell index, Atterberg Limits and natural moisture content testing.

12.1.3 Founding Conditions

The subsurface soil profile identified within the boreholes generally indicated the presence of stiff to hard clays and variable depths of penetration refusal. It is considered that penetration refusal may be encountered on continuous bedrock, however basalt boulders are common within these geological deposits and may cause penetration refusal. The existing shallow clays are likely to provide suitable founding conditions for residential, lightweight and commercial infrastructure. Larger infrastructure such as multi-storey developments or buildings with excessive structural loading may require founding on bedrock materials (eg. through usage of piling or other

deep footing systems) which are generally capable of withstanding increased construction loading and unlikely to exhibit high settlement characteristics.

Where infrastructure is proposed on areas of landslide susceptibility zones, it is recommended that consideration is given to the design of the development to ensure that no changes in the stress regime occur that may trigger landslides or erosion. Development should be avoided where it is considered that erosion or landslides are likely to occur and cannot be controlled with appropriate engineering design.

12.1.4 Pavements

Pavements proposed within the Study Area will also need to consider the presence of highly reactive clays which are likely to influence the applicable design CBR values and requirements for subgrade protection measures such as capping layers. From experience with similar soils in other regions of Victoria, soaked CBR values in residual basaltic clays can typically range from 0.5 to 3 with the lower CBR values generally corresponding to a high silt content. CBR values exceeding 3 are not uncommon and can typically be found where the presence of sands or gravels are high within a representative sample. Residual basaltic clays typically exhibit high swell values and are considered to be expansive in nature.

Consideration must be given to the different geological units present within the Study Area and the characteristics of these deposits. It is considered that where geological boundaries exist that differential movements may occur within the subsurface soils which would need to be considered for the development for pavements and also any proposed infrastructure.

Land use planning should consider restricting potential abnormal moisture conditions from occurring where highly reactive subgrades exist. This may involve certain drainage techniques, consideration of the influence of trees near proposed infrastructure/pavements and protecting underground services from leaks.

12.1.5 Earthworks

Earthworks are likely to be part of development phases of the Study Area and may comprise of minor reshaping works or extensive bulk earthworks across the various developments. It is considered that excavations required for the installation of sewer systems or similar will be a key constraint in developments, particularly where sites are underlain by shallow bedrock. General construction and earthworks activities are likely to involve removal of sections of the subsurface soil profile. It is considered that where deep clay soil profiles are encountered that conventional excavation equipment may be suitable for excavations. Where shallow bedrock is encountered, excavations within the bedrock material may require larger plant and ripper and hydraulic rock breaking equipment. Rock stitching and blasting may be required for some excavations dependant on the specific site conditions.

The existing subsurface soils are generally considered suitable for use as controlled fill based on its engineering properties, cohesiveness and workability. Consideration must however be given for the anticipated highly expansive nature of the natural subsurface soils. It is considered that where highly reactive soils are placed as fill that characteristic surface movements may be increased significantly which may affect design work.

Where sand or silt materials are encountered, suitable control of these materials and drainage measures are likely to be required. Sand and silt materials are considered sensitive to moisture ingress and may be subject to erosion. Stabilisation of subgrade materials or other similar engineering techniques may be required should development take place during winter periods.

12.2 LANDSLIDE ASSESSMENT

This assessment identifies potential landslide susceptibility and hazard to assist with land use planning. Only a basic assessment could be provided based on the scale of the Study Area, basic desktop study performed of existing plans/aerial imagery, the limited scope/access of the field investigation and limited information supplied for the proposed development area.

To summarise the AGS publication, landslide susceptibility zoning 'involves the classification, volume (or area) and spatial distribution of existing and potential landslides in the Study Area'. Landslide hazard zoning considers the outcomes of the susceptibility mapping and assigns the estimated frequency to the potential landslides.

The landslide assessment was performed on the existing monocline area which was observed to be the only sloping area of the Study Area. The field investigation and visual assessment performed at the Study Area did not identify any features indicating current landslide occurrence. It was noted that sloping embankments of the monocline posed a potential for landslide, mainly within the existing gullies and ravines noted within the Study Area. Areas of rock outcrops were observed within the northern section of the site which were considered to have the potential for rock fall. No surface features indicated recent failure of the rock outcrops or within the soils assessed.

The desktop study identified areas of erosion and inferred paleo landslide deposits, based on the geomorphology and physical expressions of the surface. Five main areas of potential erosion/landslide were identified during the desktop study. The flank of the monocline was observed to slope moderately to steeply to the east, and although without any indication of landslide failure during the investigation, it was considered that the slope angle posed potential for landslide. The locations of these areas discussed have been indicated on Figures 7 and 8 and are discussed in further detail below.

During the desktop study, hummocky ground was inferred on the northern embankment of the existing gully feature approximately 2km south of Staceys Road and 1km west of Bacchus Marsh Road. The hummocky ground was observed to be subdued and not considered to indicate recent deposition. Aerial imagery dating back to 2002 did not indicate any fresh landslide/erosion up to present imagery (2016). The observations of the desktop study generally suggest that these landslides were of small scale do not indicate large volumes of soil having failed or having travelled large distances. With regards to current geological maps, it is considered the subsurface soils within the area where hummocky terrain was observed comprises of Fyansford and Moorabool silt, sand and clay deposits; it is considered that the residual soils within this area may be more susceptible to failure with changes in the stress regime, and potential larger scale landslides may occur within this area if disturbed. It should be noted that existing surface was observed to be subdued within the aerial imagery used from 2002 to 2016 and an assessment on the frequency could not be accurately performed. Further investigation in these areas is recommended to better understand the landslide susceptibility, hazard and risk.

A gully feature observed approximately 100m south of Staceys Road indicated the presence of rock outcrops along the southern and eastern flanks of the gully, extending approximately 400m in length. The rock outcrops were observed to be intermittent across the length of the area observed. No recent failures within this area were observed during the site walkover, geotechnical investigation or aerial imagery dating back to 2002.

Areas of shallow surface erosion were identified from the desktop study. These areas were observed on the southern flank of the gully feature 2km south of Staceys Road and on the existing slope of the monocline approximately 0.6km west of Tower Hill Drive and 0.4km north of Viewbank Rise. These were observed to have occurred between 2002 and 2016 with intermittent signs of surface erosion occurring.

Areas of the monocline have been identified for potential landslide susceptibility, mainly within existing gullies/ravines, where rock outcrops are present and with occasional areas of shallow surface erosion. It is

considered that most areas indicating erosion/landslide are isolated and of small scale. With regards to the existing slope of the monocline, it is considered that the area may pose low susceptibility for large landslides to occur.

Data records from GeoScience Australia indicated a low frequency of earthquakes from 1955. 44 earthquakes were recorded with magnitudes of 4 or greater and at depths of less than 100km within Victoria. One earthquake was recorded in the Geelong area which was recorded during December 1977, recording a magnitude 4.7 earthquake at a depth of 16km. The earthquake was noted to cause some damage to the area with brick walls exhibiting damage and the failure of a granite block from Mt Anakie. Based on the results of the dataset and recorded events occurring from earthquakes within Geelong, it is considered that earthquakes may trigger landslide events, however based on the frequency and magnitude of earthquakes that have been recorded in this area and no landslides documented within the study area as a result of the earthquakes, it is considered that landslides triggered by earthquakes poses a low risk.

Data records of rainfall from the Bureau of Meteorology with reference to Bureau station located at the Lovely Banks Reservoir generally indicate once yearly the area will receive high rainfall of 100mm or more within a month. Due to the lack of aerial imagery to compare to heavy rainfall events with evidence of landslide events, no correlation was made between heavy rainfall and landslide events. However, it can be considered that high rainfall events are likely to occur within the Lovely Banks area and suitable drainage should be considered to divert water from areas susceptible of landslip or erosion. Regardless of the lack of correlations observed, it is considered that heavy rainfall for extended durations are a driving force in the cause for landslides and this must be considered for the diversion of surface waters. Where development occurs, drainage of the site must prevent surface waters from shedding toward the existing slopes (escarpment) and prevent the potential for pore fluid pressures to form behind the existing slopes. It is considered that development of the study area will create impervious surfaces and alter existing drainage conditions. Drainage design must consider the potential for landslide susceptibility within and at the crest of the escarpment.

This assessment has considered the landscape from field observations and aerial imagery from 2002 to 2016. Changes to the existing surface with cut/fill processes/removal of vegetation, changes in drainage conditions, and overall changes in the stress regime may alter the potential for landslide at the study site, particularly within the existing monocline. It is considered that further investigation is required to identify the landslide susceptibility within the escarpment with particular reference to the proposed development, the potential hazards that may exist from landslide events and the risk for landslide should development occur. The further investigation should assess the escarpment in its current condition and the potential risk for landslide where development will occur. Recommendations must be given to provide advice on how to mitigate the potential for landslide.

12.3 MONOCLINE SIGNIFICANCE

Monoclines are a physical surficial feature of previous tectonic activity where faulting and movement of the crust creates a change in the topography of the land. Monoclines are a bend in the earth's crust where the rock strata uniformly dips in one direction after being displaced. Monoclines are not considered to be a rare geological feature and may only be significant locally or regionally for historical purposes or general processes that have developed on the surface as a result of the surface feature.

The importance of the existing monocline feature to the Lovely Banks area is that it delineates the western margin of Port Phillip Sunkland and the change in surface topography and geology of the region. The management of the feature is considered Class 2 which requires to maintain the significance of the feature by preventing infrastructure or other obstructive structures away from the crest and slopes. It is recommended that development within these areas is restricted to rural land use or as an open space corridor through built up land.

At the time of the investigation, development of the area was observed with occasional residential dwellings and rural farming activities. The significance of the monocline locally and regionally must be considered when land planning and proposed development takes place.

With reference to Victorian Resources online (2015) and Goehheritage and Geoconservation (2007), development within the slopes of the monocline should be limited to rural development or recreational land use such as parks. Development within the monocline or associated gully/ravines are considered to be susceptible to landslide. Where development does occur, consideration must be given to geomorphic, landslide susceptibility and hazard mapping. The physical extent of the escarpment has been attempted to be identified on Figure 9 to assist with assessing potential constraints for the development of the study area.

12.4 EARTHQUAKE RATING

The geotechnical investigation generally indicated the presence of shallow rock from both site observations and the results of the boreholes where refusal was encountered at depths as shallow as 0.1m. Some boreholes encountered deeper soils where boreholes were terminated as deep as 3.9m below surface levels. It should be noted that earthquake rating will vary across site and is dependent on the depth and strength of both soil and/or rock. Based on the results of the investigation, with reference to geological maps and observations of the investigation, it is considered that earthquake ratings of Class B_e – Rock and C_e – Shallow soil are likely to apply to a large portion of the Study Area. Site specific investigations would be required to consider that earthquake rating for any larger infrastructure.

13. CONCLUSIONS

This investigation was undertaken to evaluate the feasibility and limitations of land development within the Study Area, with consideration of geotechnical, hydrogeological and environmental contamination risks. The desktop phase of the study was performed to identify any areas of potential concern, with a subsequent field investigation to validate anticipated conditions. The results of the investigation identified the presence of the monocline intersecting the eastern section of Study Area and highly reactive clays as the primary features of concern, with other conditions found to present low or site-specific risks.

13.1 HYDROGEOLOGICAL AND CONTAMINATED LAND

The recharge and discharge conditions of aquifer systems within the Study Area are not expected to be significantly influenced by typical commercial or residential development. The low permeability clay, shallow basalt and low yields associated with the local hydrogeological conditions may inhibit use of integrated Water Cycle Management (IWCM) features, such as soakage pits, however further analysis of the IWCM strategy should be undertaken. Additionally, where groundwater is proposed for extraction or where beneficial uses may be impacted, further assessment of local conditions should be considered.

Based on the results of the desktop study, field observations and a preliminary soil investigation, several sites within the Study Area were identified as presenting a High or Medium risk of potential contamination. The PFC risk levels were assigned based on assumed development for sensitive land use, with the following recommendations for further investigation:

- High PFC risk sites – An Environmental Audit of land should be undertaken prior to redevelopment for a more sensitive land use. These requirements may be triggered using an EAO or Ministerial Direction No. 1; and
- Medium PFC risk sites – An environmental site assessment should be undertaken to determine whether the site is suitable for the proposed use or an Environmental Audit should be undertaken; and
- Low PCF risk sites – No further investigation recommended. General duties under the Planning and Environment Act (1987) must be ensured.

The requirements above should be undertaken through planning approvals, however further investigation of the former airfield (Figure 9) should be undertaken prior to redevelopment. The previous extent and operations in addition to current conditions should be confirmed to inform Environmental Audit requirements (if relevant).

13.2 GEOTECHNICAL

From a geotechnical perspective and with reference to the desktop and field investigations, no major development risks are identified, with the exception of the Lovely Banks Monocline, which in itself is considered a manageable risk. The investigation, albeit limited, has not identified areas of extensive soft soils, compressible soil zones (such as peat or extensive silts) or extensive fill (quarry backfill or landfills) however this does not exclude the possibility of such zones to exist within parts of the Study Area. Key issues and constraints identified through the geotechnical investigation include:

- Shallow continuous bedrock, highly reactive and expansive soils are likely to impact development of infrastructure and may pose trafficability issues which requires appropriate planning and implementation of effective strategies through civil design to mitigate any of the above impacts on development;
- Areas of landslide susceptibility, hazard and erosion were identified within the existing monocline physical escarpment feature however the majority of the escarpment is considered as low susceptibility and hazard for small to large scale landslides. Further detailed studies, modelling and investigations are required to obtain a detailed analysis on the monocline feature.

14. GENERAL LIMITATIONS

Ground Science has prepared this document in accordance with the scope of works and for the purpose outlined in the accepted proposal (GSP2016095 AC, dated 16 May 2016) and this report.

The advice given in this report is based on the assumption that the conditions are representative of the overall Study Area. However, it should be noted that actual conditions might differ from those assumed. If sampling reveals soil conditions significantly different from those assumed, Ground Science must be consulted.

It is recognised that the passage of time affects the information and assessment provided in this document. Ground Science's assessment is based on information that existed at the time of the preparation of this document. It is understood that the services provided allowed Ground Science to form no more than an opinion of the actual Study Area conditions observed and cannot be used to assess the effects of any subsequent changes in the quality of the Study Area, or its surroundings, or any laws or regulations.

Where data has been supplied by the client or a third party, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by Ground Science for incomplete or inaccurate data supplied by others.

Any drawings or figures presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

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15. REFERENCES

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Figures

FIGURES

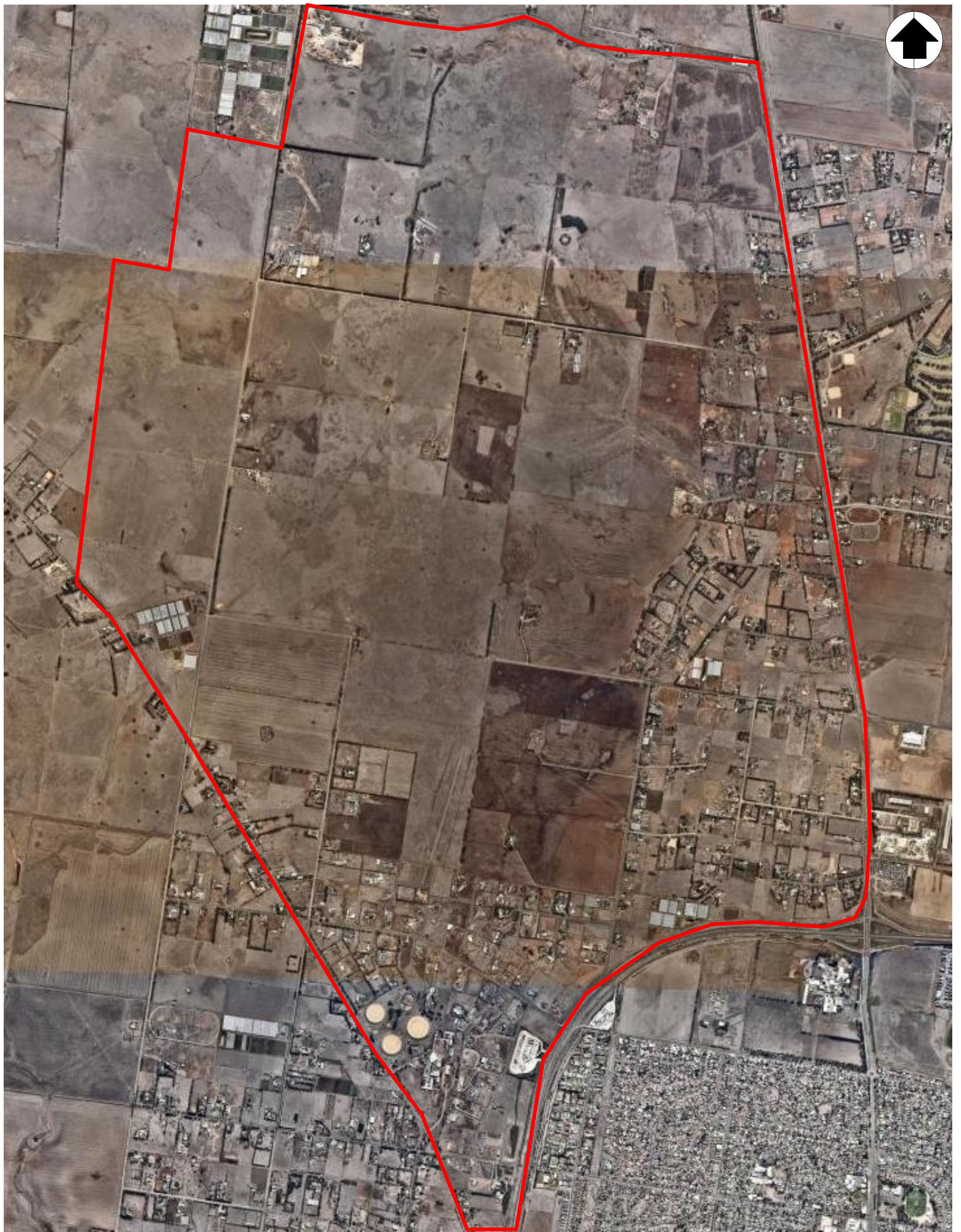


Figure 1
Study Area
Northern FIA, Lovely Banks

JOB NO: G3154.3 AB
DATE: 6th April 2017
SCALE: NOT TO SCALE

DRAWN: JM
CHECKED: TH

LEGEND

 Study Area



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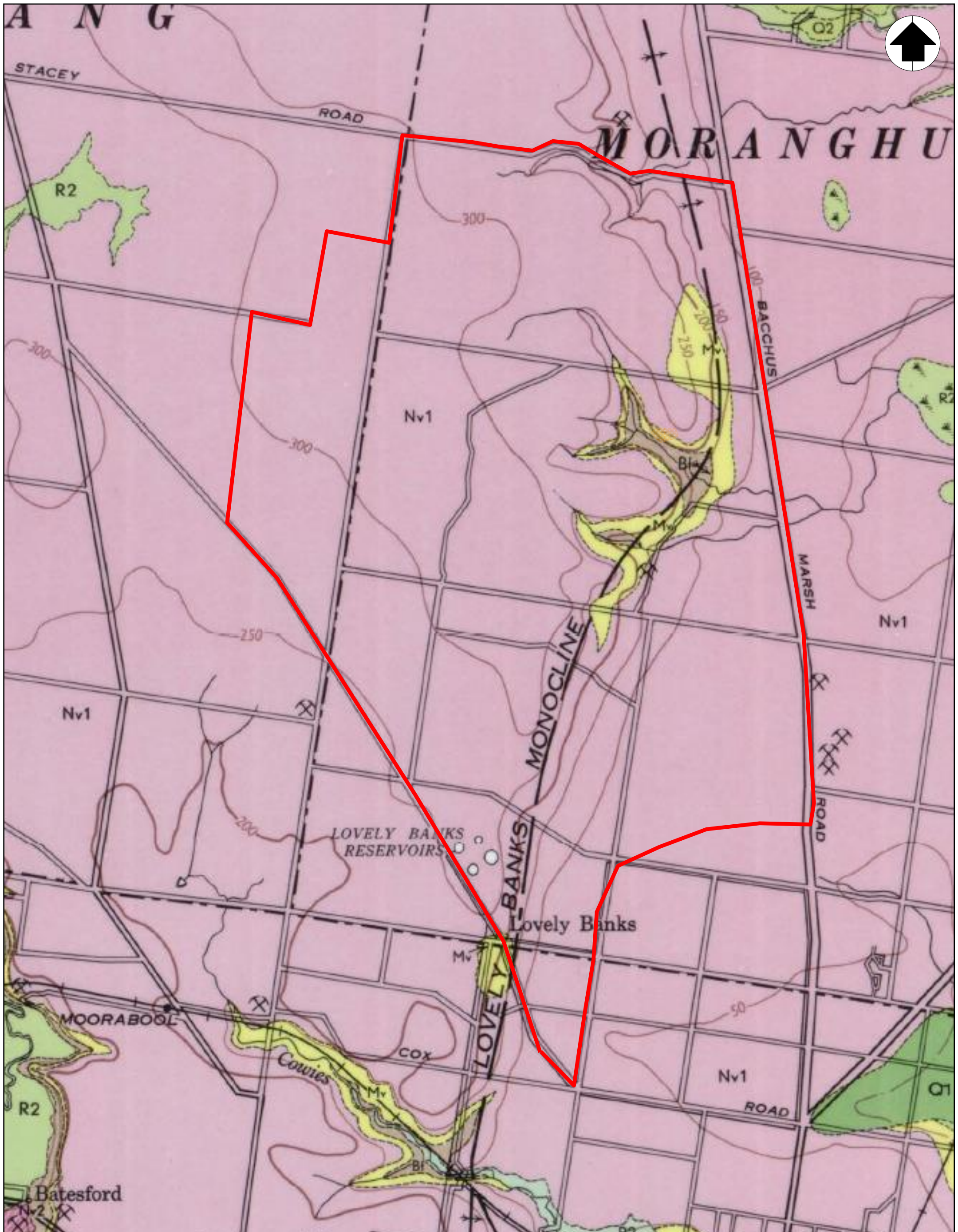


Figure 2
Study Area Geology
 Northern FIA, Lovely Banks

JOB NO: G3154.3 AB
 DATE: 6th APRIL 2017
 SCALE: NOT TO SCALE

DRAWN: JM
 CHECKED: TH

LEGEND

- Nv1 QUATERNARY NEWER VOLCANIC BASALT
- Mv TERTIARY MOORABOOL VIADUCT SANDS
- Bf TERTIARY FYANSFORD FORMATION
- APPROXIMATE STUDY AREA BOUNDARY



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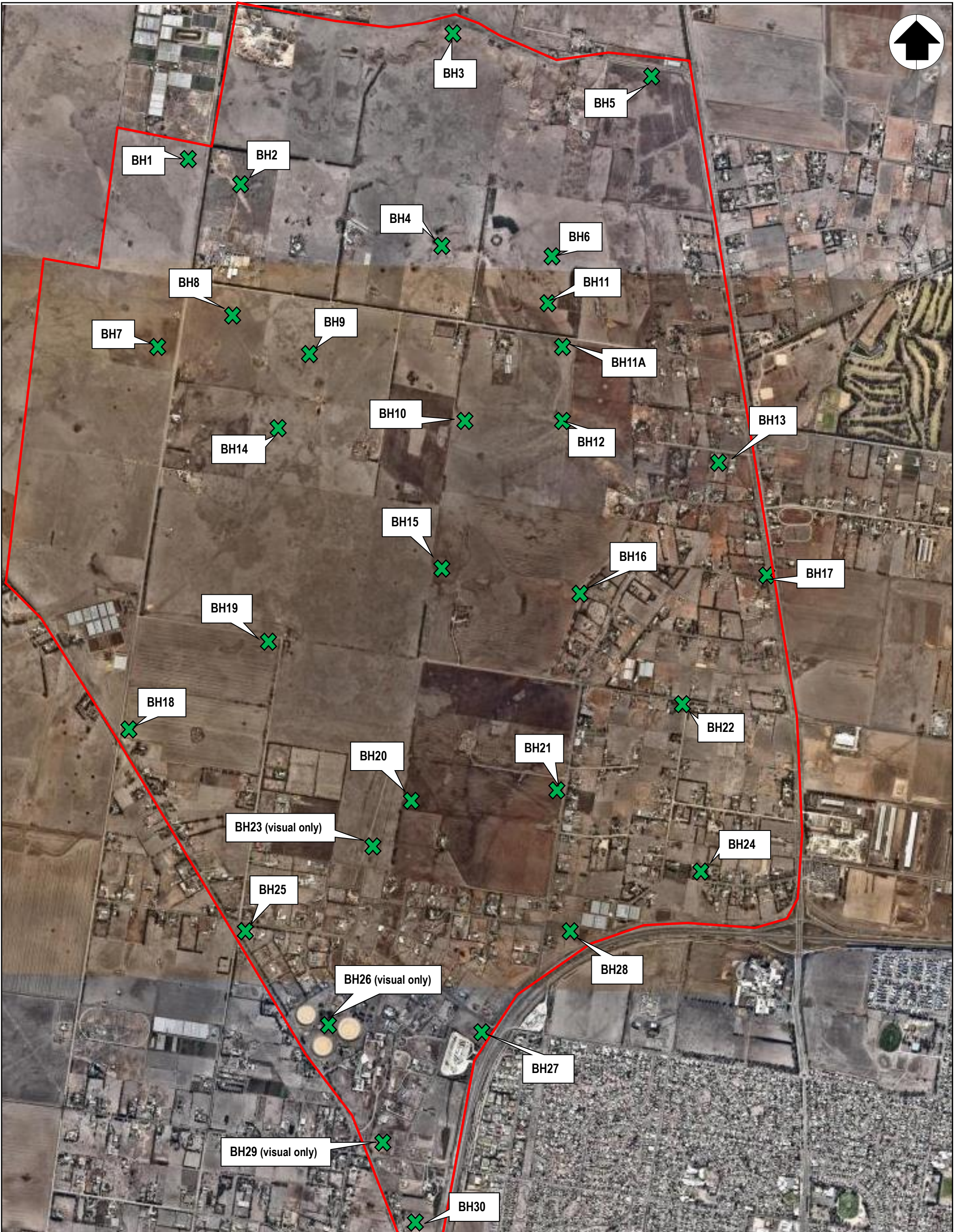




Figure 3
Borehole Locations
Northern FIA, Lovely Banks

JOB NO: G3154.3 AB
DATE: 6th APRIL 2016
SCALE: NOT TO SCALE

DRAWN: JM
CHECKED: TH

LEGEND

-  Borehole Location
-  Site Boundary



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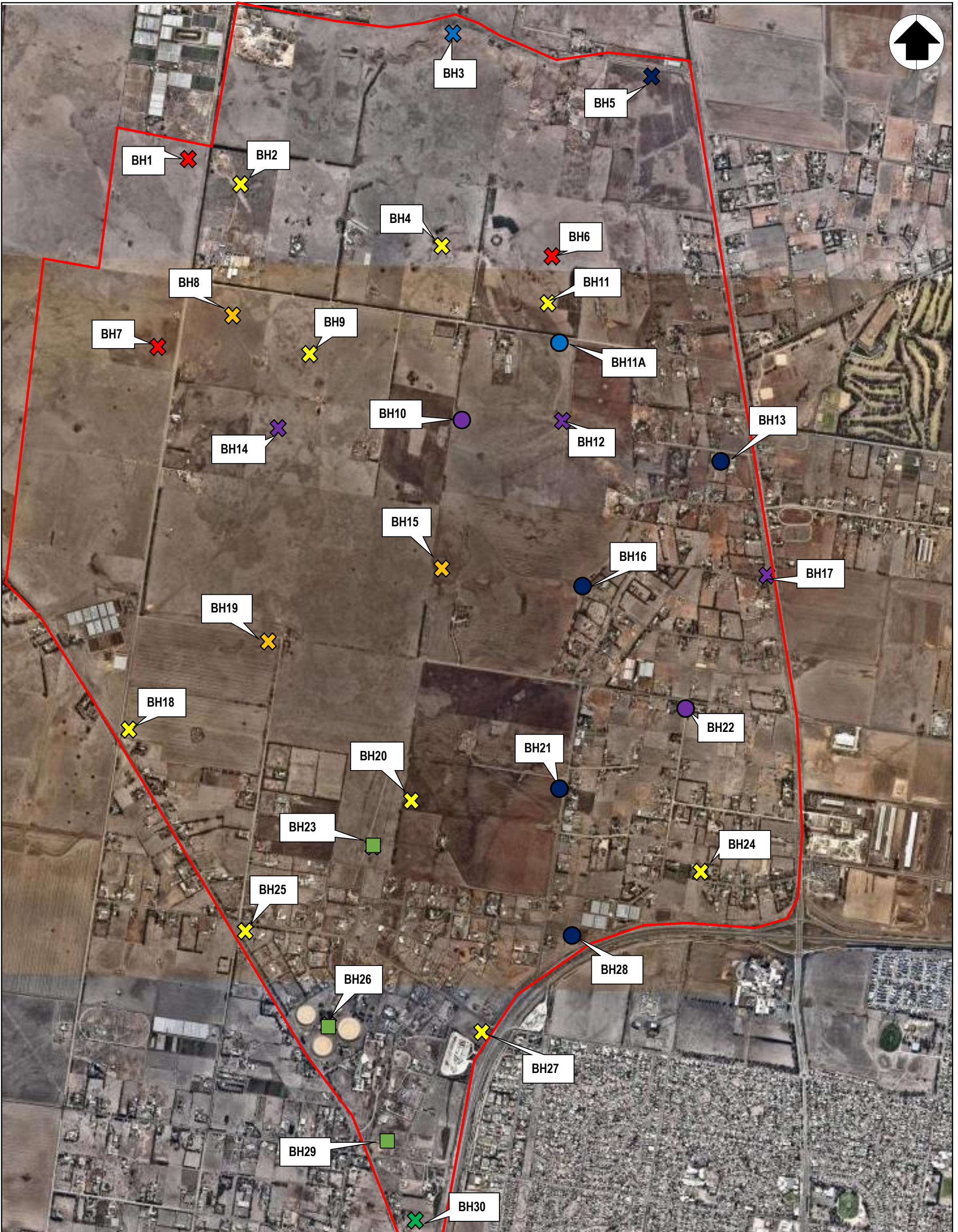






Figure 4
Borehole Locations
Northern FIA, Lovely Banks








JOB NO: G3154.3 AB
 DATE: 6th APRIL 2016
 SCALE: NOT TO SCALE

DRAWN: JM
 CHECKED: TH

LEGEND

-  Site Boundary
-  Borehole Refusal
-  Borehole Terminated
-  Visual Inspection

DEPTH OF BOREHOLE

-  0.0m – 0.5m
-  0.5m – 1.0m
-  1.0m – 1.5m
-  1.5m – 2.0m
-  2.0m – 2.5m
-  2.5m – 3.0m
-  3.0m +



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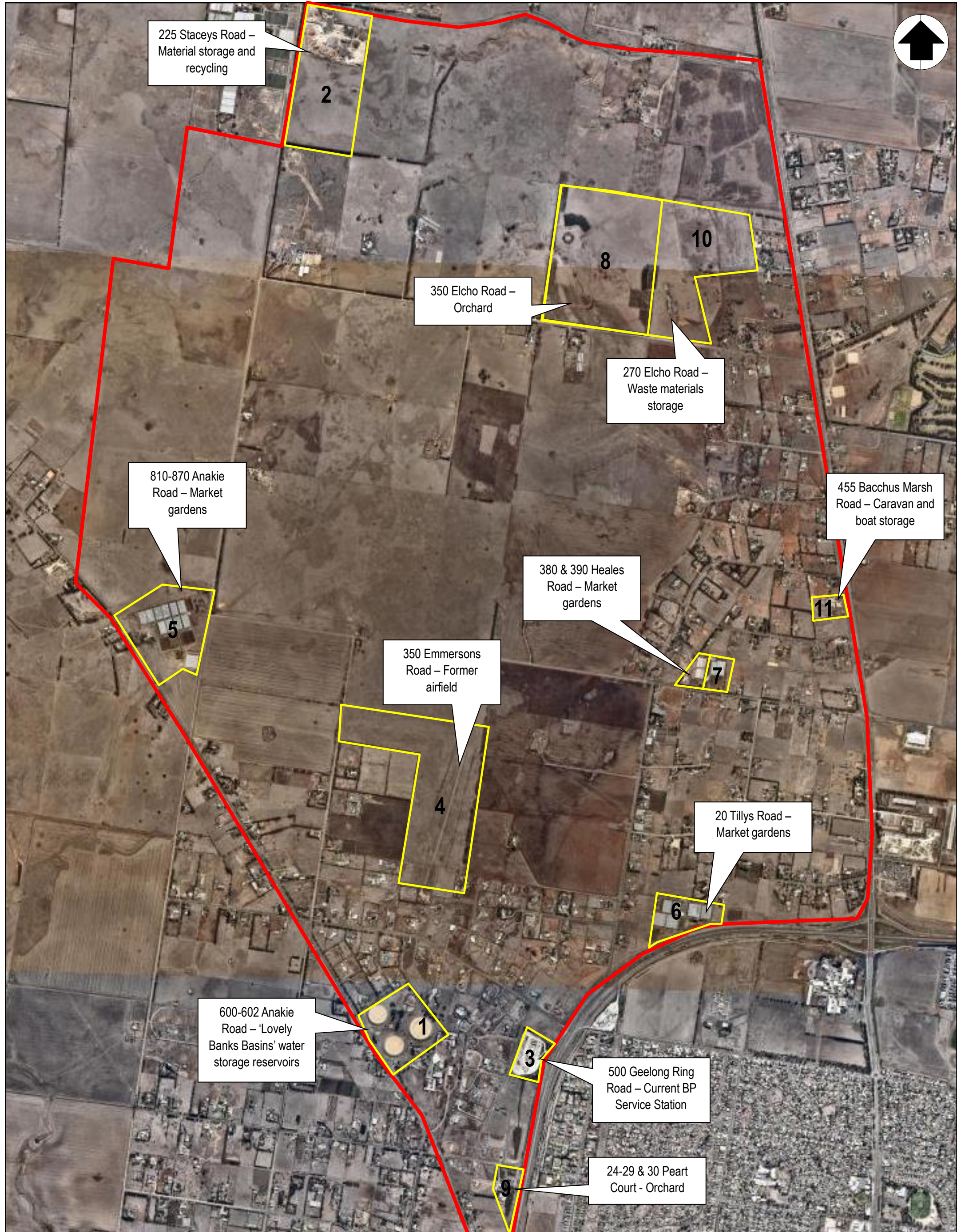


Figure 5
Contamination Risk Assessment
Northern FIA, Lovely Banks

LEGEND

Study Area

Sites assigned Medium or High PCF Risk

JOB NO: G3154.3 AB
 DATE: 6th APRIL 2017
 SCALE: NOT TO SCALE

DRAWN: JM
 CHECKED: JF



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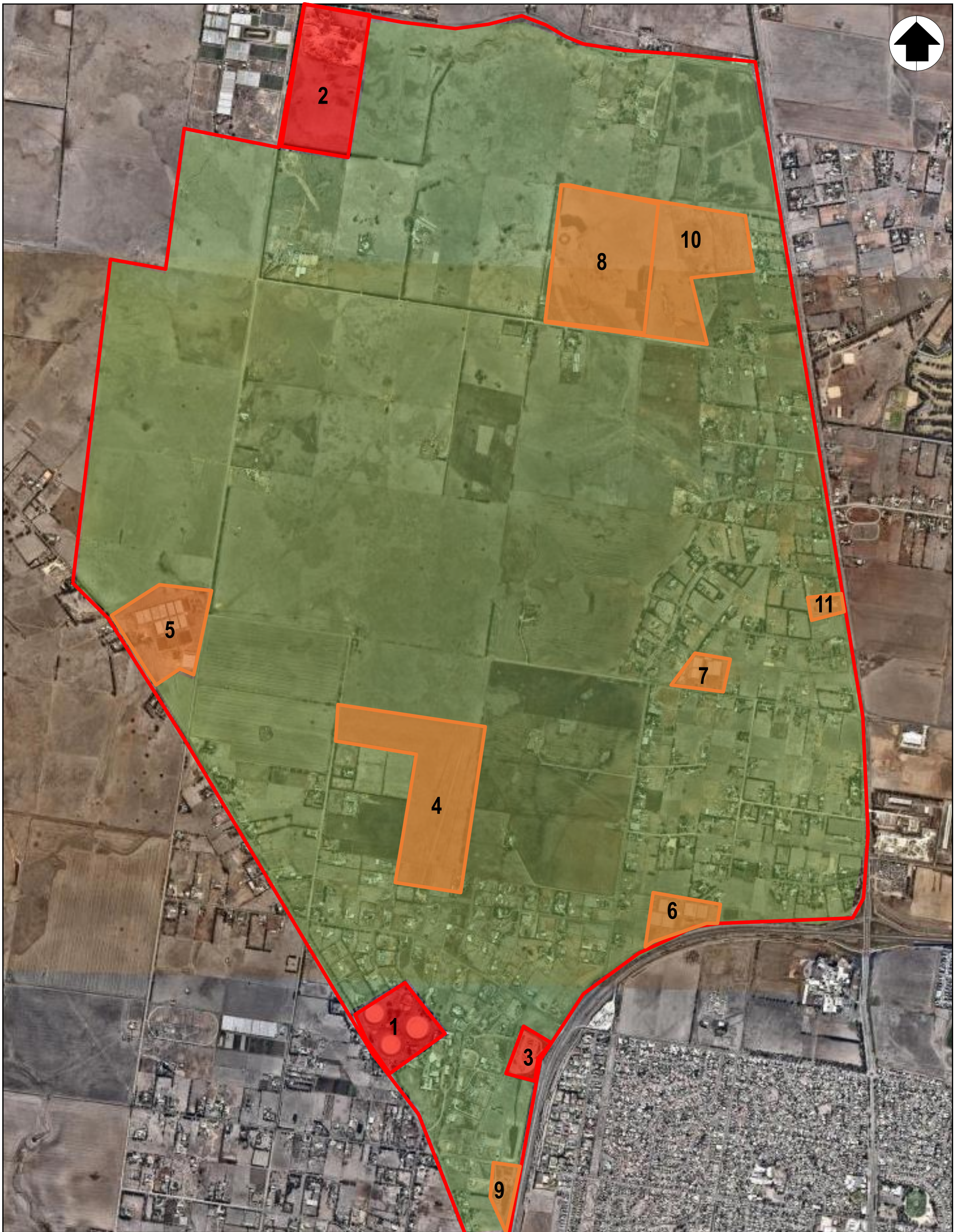





Figure 6
Contamination Risk Assessment
Northern FIA, Lovely Banks

JOB NO: G3154.3 AB
DATE: 6th APRIL 2017
SCALE: NOT TO SCALE

DRAWN: JM
CHECKED: JF

LEGEND

-  STUDY AREA
-  Low PFC Risk
-  Medium PFC Risk
-  High PFC Risk



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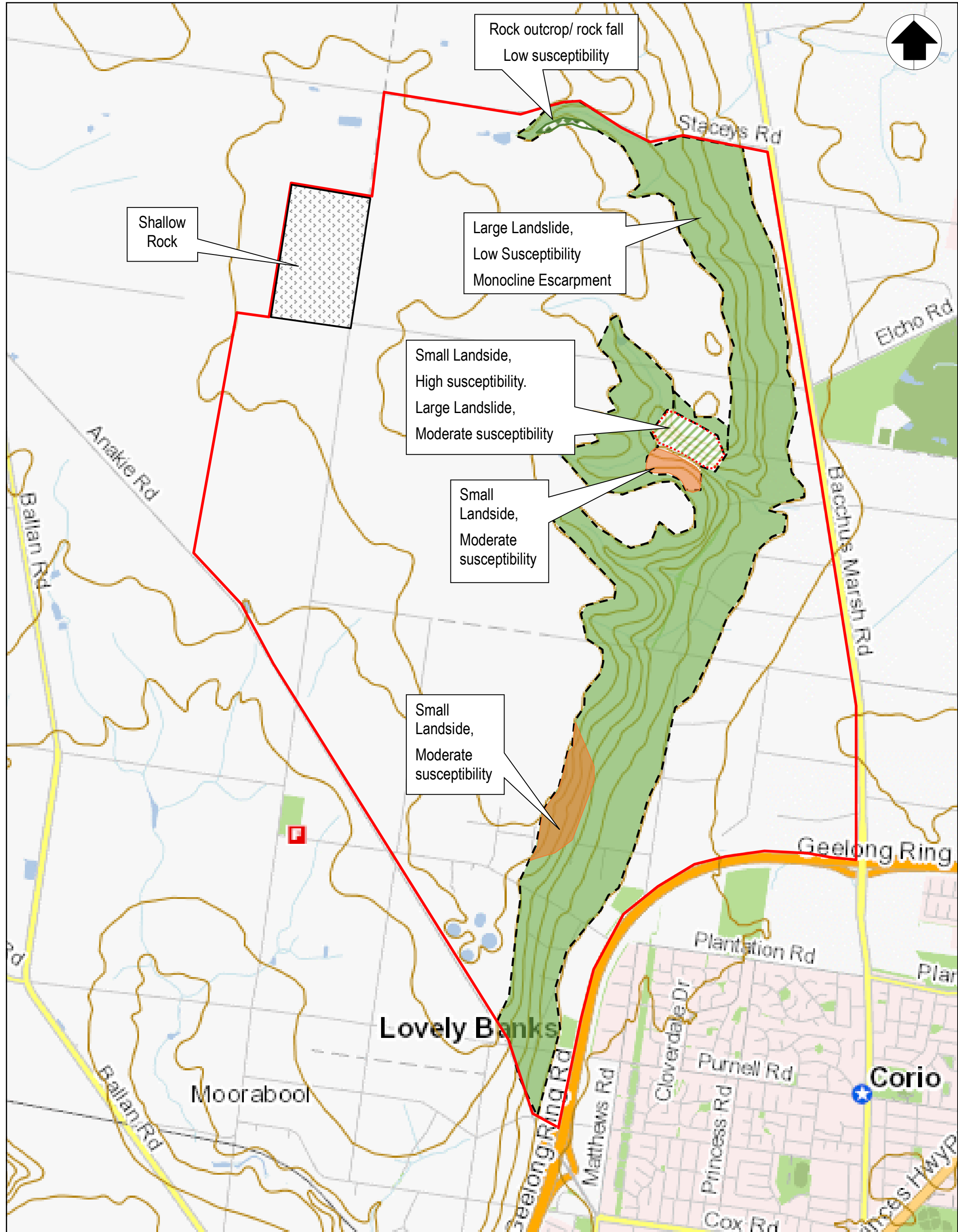









Figure 7
Landslide/ Geological Constraints
Northern FIA, Lovely Banks

JOB NO: G3154.3 AB
 DATE: 6th April 2017
 SCALE: NOT TO SCALE

DRAWN: JM
 CHECKED: TH

LEGEND

-  Large Landslide – Low Susceptibility (approx. location)
-  Small Landslide – Moderate Susceptibility (approx. location)
-  Small Landslide – High Susceptibility (approx. location)
-  Large Landslide – Moderate Susceptibility (approx. location)
-  Rock Falls – Low Susceptibility (approx. location)
-  Monocline Escarpment
-  Site Boundary



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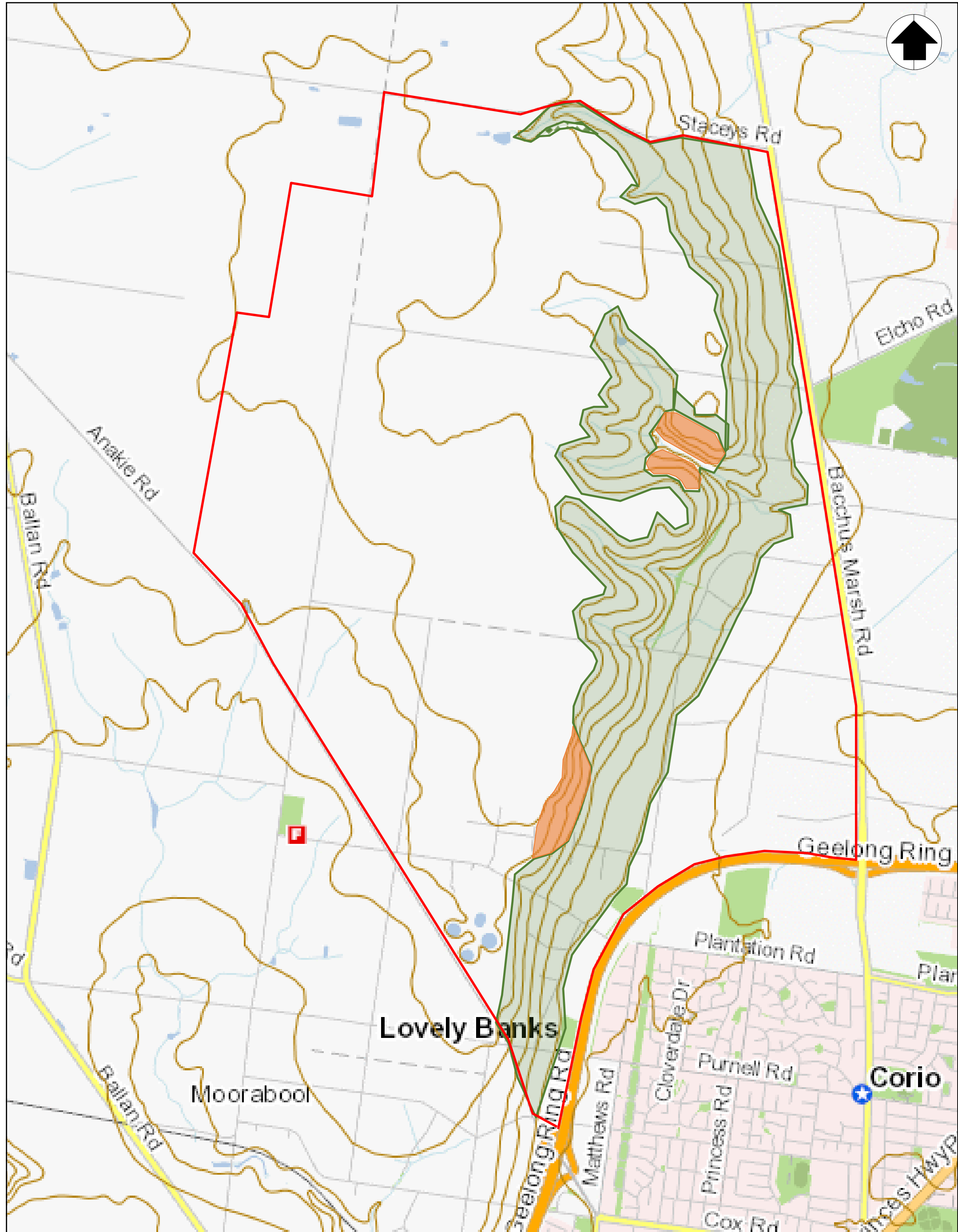


Figure 8
Landslide/Geological Constraint
Northern FIA, Lovely Banks

JOB NO: G3154.3 AB
 DATE: 6th April 2017
 SCALE: NOT TO SCALE

DRAWN: JM
 CHECKED: TH

LEGEND

- Individual Landslides - Low Hazard (approx. location)
- Individual Landslide - Moderate Hazard (approx. location)
- Rock Falls – Low Hazard (approx. location)
- Site Boundary



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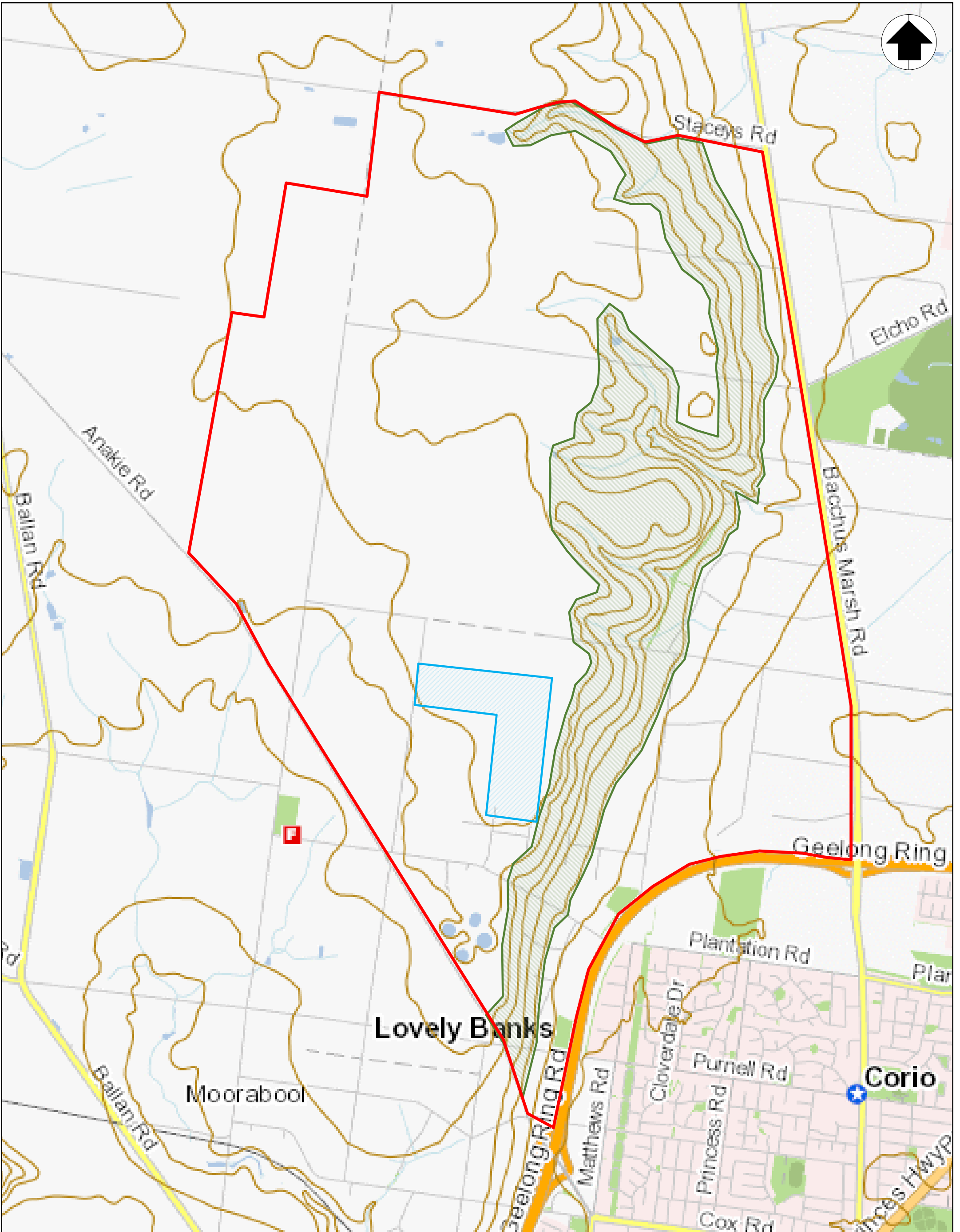
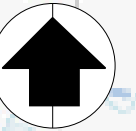




Figure 9
FURTHER INVESTIGATION
 Northern FIA, Lovely Banks

LEGEND

-  Area of Further Investigation & Consideration: Lovely Banks Monocline
-  Further environmental investigation recommended

JOB NO: G3154.3 AB
 DATE: 6th April 2017
 SCALE: NOT TO SCALE

DRAWN: JM
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APPENDIX A – TITLE INFORMATION

Certificates of Title Summary

Search area	Registered Proprietor	Vol / Folio	Date	Comments
Central location within Study Area	J.F. Guthrie (Corriedale) Proprietary Limited	6741 / 171	1935-54	Title covering land between Evans Rd - Bacchus Marsh Rd and Heales Rd – north of Elcho Rd. No details of land use, however land is subject to be utilised for mining pending licenses
	Douglas Winton and Annie Jean Hodges – sheep farmers	8043 / 082	1954-87	Title covering the southern section of previous title. Land use likely farming – sheep grazing
	EOE (No. 76) Pty Ltd	9815 / 962	1987-93	Covering the south west section of previous
	Geeport Developments Pty Ltd	10139 / 556	1993-95	No specific details
		10224 / 410	1995-95	No specific details
Aprigo Pty Ltd	10781 / 200	1995-16	460 Evans Road, Lovely Banks	
Lovely Banks water storage facility	Barwon Water Corporation	11411 / 349	2013-15	No parent title – indicates long-term historical ownership
Geelong Baptist College – to establish history of adjacent water reservoir	David Fye Griffiths – Solicitor	05398 / 503	1928-36	Title covers several properties surrounding Barwon Water site, north of Anakie Road. Confirms water reservoir older than 1928
	Robert Adam Griffiths – Farmer	06041 / 167	1936-73	Title has the boundaries as previous. Listed as farmers, likely grazing
	Roman Catholic Trusts Corporation	08996 / 214	1973-87	Title covers a parcel north of the water reservoir and a parcel covering the current school property.
	Trustees of the Christian Brothers of Mount St. Mary's	09785 / 357	1987-05	Title split with northern property sold separately during ownership
	Geelong Baptist College	10585 / 171	2005-16	Title split to cover only the current school

HISTORICAL SEARCH STATEMENT

Land Victoria

Produced 19/08/2016 04:03 PM

Volume 10260 Folio 022
 Folio Creation: Created as a computer folio
 Parent title Volume 10224 Folio 410

RECORD OF HISTORICAL DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged	Dealing Type and Details
20/09/1996	24/10/1996	U417550G	Y	CAVEAT ROACHE, KEVIN EDWARD FLANAGAN, PETER JOHN
20/09/1996	08/11/1996	U417793T	Y	MORTGAGE AND LAPSING OF CAVEAT
20/09/1996	08/11/1996	U417793T	Y	MORTGAGE AND LAPSING OF CAVEAT U417550G
11/05/1998	05/06/1998	V415107F	N	VARIATION OF MORTGAGE/CHARGE U417793T
14/04/1999	19/08/1999	V988807B	Y	CAVEAT TRANSMISSION PIPELINES AUSTRALIA (ASSETS) PTY LTD
02/06/1999	12/10/1999	W080096E	Y	NOTIFICATION OF CHARGE EASEMENT OR RIGHT AND LAPSING OF CAVEAT NO.V988807B

RECORD OF VOTS DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged
20/03/2002	14/10/2002	AB163216J	Y
TRANSFER OF MORTGAGE MORTGAGE U417793T 20/09/1996 SHORE SECURITIES LIMITED VARIATION OF MORTGAGE V415107F 11/05/1998 TRANSFER OF MORTGAGE AB163216J 20/03/2002			
10/04/2003	10/04/2003	AC000355X	Y
DISCHARGE OF MORTGAGE MORTGAGE(S) REMOVED AB163216J U417793T V415107F			
10/04/2003	10/04/2003	AC000357T	Y

HISTORICAL SEARCH STATEMENT

Land Victoria

MORTGAGE OF LAND

MORTGAGE AC000357T 10/04/2003
SHORE SECURITIES LIMITED

24/12/2004 24/12/2004 AD331736D Y

DISCHARGE OF MORTGAGE

MORTGAGE(S) REMOVED
AC000357T

STATEMENT END

VOTS Snapshot

Volume 10260 Folio 022
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LAND DESCRIPTION

Lot 2 on Plan of Subdivision 344243D.
PARENT TITLE Volume 10224 Folio 410
Created by instrument PS344243D 29/11/1995

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
APRIGO PTY LTD of 27 FAIRY STREET NORTH GEELONG 3215
PS344243D 29/11/1995

ENCUMBRANCES, CAVEATS AND NOTICES

MORTGAGE U417793T 20/09/1996
KEVIN EDWARD ROACHE
PETER JOHN FLANAGAN
Variation of Mortgage V415107F 11/05/1998

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE PS344243D FOR FURTHER DETAILS AND BOUNDARIES

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Volume 10224 Folio 410

Folio Creation: Created as paper folio continued as computer folio

Parent title Volume 10139 Folio 556

RECORD OF HISTORICAL DEALINGS

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RECORD OF VOTS DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged
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STATEMENT END

Paper Title Images

10224/410 - Version 0, Date 23/04/1999

CANCELLED

REGISTER BOOK

VOL 10224 FOL 410

ORIGINAL

**NOT TO BE TAKEN FROM THE OFFICE
OF TITLES**



VICTORIA

Certificate of Title

UNDER THE "TRANSFER OF LAND ACT"

GEEPORT DEVELOPMENTS PTY. LTD. OF HEALES ROAD LOVELY BANKS IS THE PROPRIETOR OF AN ESTATE IN FEE SIMPLE SUBJECT TO THE ENCUMBRANCES NOTIFIED HEREUNDER IN ALL THAT PIECE OF LAND IN THE PARISH OF MORANGHURK BEING THE LAND IN PLAN OF CONSOLIDATION NO. 354982U - - - - -

DATE: 23/12/94
DERIVED FROM VOL.10139 FOL.556 T480766Y



ASSISTANT REGISTRAR OF TITLES

ENCUMBRANCES REFERRED TO

ANY ENCUMBRANCES CREATED BY SECTION 98 OF THE TRANSFER OF LAND ACT 1958 OR SECTION 24 OF THE SUBDIVISION ACT 1988

ANY OTHER ENCUMBRANCES SHOWN OR ENTERED ON THE SAID PLAN

AS TO PART OF THE LAND

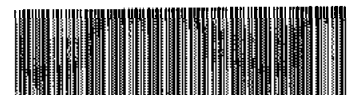
MORTGAGE P78143E TO NATIONAL MUTUAL ROYAL BANK LIMITED

**THE ABOVE MORTGAGE IS
DISCHARGED**

AS TO PART BEING
THE WITHIN LAND
2-10-95



PLAN PS 344 243
AFFECTS LAND HEREIN



T10224-410-1-6

SEE PC354982U FOR BOUNDARIES AND OTHER DETAILS

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AS TO PART OF THE LAND

CAVEAT

CAVEATOR: STATE BANK OF NEW SOUTH WALES
CAPACITY: MORTGAGEE
DATE OF CLAIM DOCUMENT: 8/12/89
LODGED BY: 1177B MALLESONS STEPHEN JAQUES
OF 525 COLLINS ST. MELBOURNE
3000

NOTICE TO: AS ABOVE
NO: P675346B
DATE: 22/2/90

~~CAVEAT WITHDRAWN~~

2-10-95
AS TO WITHIN LAND.



CAVEAT

CAVEATOR: ANTHONY GARDINER SHERLOCK
PROVISIONAL LIQUIDATOR OF
LOC-TAX INTERNATIONAL PTY. LTD.

CAPACITY: SEE CAVEAT
LODGED BY: BLAKE DAWSON WALDRON
NOTICE TO: 140 WILLIAM ST. MELBOURNE 3000
NO: P961081Y

DATE: 17/8/90

~~CAVEAT WITHDRAWN~~

2-10-95

AS TO PART OF THE WITHIN LAND



CAVEAT

CAVEATOR: STATE BANK OF NEW SOUTH WALES
CAPACITY: MORTGAGEE

DATE OF CLAIM DOCUMENT: 7/12/89
LODGED BY: MINTER ELLISON
NOTICE TO: 40 MARKET ST. MELBOURNE 3000
NO: R4320W

DATE: 17/9/90

~~CAVEAT WITHDRAWN~~

2-10-95

AS TO PART OF THE WITHIN LAND



AS TO PART OF THE LAND

CAVEAT

CAVEATOR: STATE BANK OF NEW SOUTH WALES
CAPACITY: MORTGAGEE
DATE OF CLAIM DOCUMENT: 14/3/90
LODGED BY: 1177B MALLESONS STEPHEN JAQUES
OF 525 COLLINS ST. MELBOURNE
3000

NOTICE TO: AS ABOVE
NO: R69665T
DATE: 30/10/90

~~CAVEAT WITHDRAWN~~

2-10-95



PROPRIETOR

APRIGO PTY. LTD.

27 FAIRY ST. BELL POST HILL 3215
T891138P 2/10/95



CANCELLED

NO. PS 344243 D



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FULLY CONVERTED TITLE

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Volume 10139 Folio 556
Folio Creation: Details Unknown
Parent titles :
Volume 09815 Folio 962
Volume 09981 Folio 299

STATEMENT END

Paper Title Images

10139/556 - Version 0, Date 19/04/1999

CANCELLED

REGISTER BOOK

VOL. 10139 FOL. 556

ORIGINAL

**NOT TO BE TAKEN FROM THE OFFICE
OF TITLES**



VICTORIA

Certificate of Title

UNDER THE "TRANSFER OF LAND ACT"

GEEPOR DEVELOPMENTS PTY. LTD. of Heales Road Lovely Banks is the proprietor of an estate in fee simple subject to the encumbrances notified hereunder in all that land in the Parish of Moranghurk being the land in Plan of Consolidation No. 354982U-

Derived From
Vol. 9815 Fol. 962 Vol. 9981 Fol. 299

26/10/93

Assistant Registrar of Titles



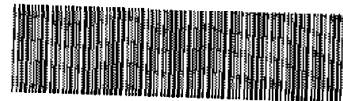
ENCUMBRANCES REFERRED TO

Any encumbrances created by Section 98 of the Transfer of Land Act 1958 or Section 24 of the Subdivision Act 1988-

Any other encumbrances shown or entered on the said Plan-

As to part of the land-

MORTGAGE P78143E - National Mutual Royal Bank Limited-



T10139-556-1-2

SEE PC354982U FOR BOUNDARIES AND OTHER DETAILS

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As to part of the land
CAVEAT

CAVEATOR: STATE BANK OF NEW SOUTH WALES
CAPACITY: MORTGAGEE
DATE OF CLAIM DOCUMENT: 8/12/89
LODGED BY: 1177B MALLESONS STEPHEN JAQUES
OF 525 COLLINS ST. MELBOURNE 3000
NOTICE TO: AS ABOVE
NO: P675346B
DATE: 22/2/90



Caveat transferred to new C/T

CAVEAT

CAVEATOR: ANTHONY GARDINER SHERLOCK
Provisional Liquidator of
Loc-Tax International Pty.
Ltd.

CAPACITY: SEE CAVEAT
LODGED BY: BLAKE DAWSON WALDRON
NOTICE TO: 140 WILLIAM STREET
MELBOURNE
NO: P961081Y
DATE: 17/8/90

Caveat transferred to new C/T



As to part of the within land

CAVEAT

CAVEATOR: STATE BANK OF NEW SOUTH WALES
CAPACITY : MORTGAGEE
DATE OF CLAIM OF DOCUMENT: 7/12/89
LODGED BY: MINTER ELLISON
NOTICE TO: 40 Market Street Melbourne
NO: R4320W
DATE: 17/9/90



As to part of the within land

Caveat transferred to new C/T

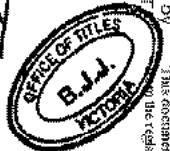
As to part of the land
CAVEAT

CAVEATOR: STATE BANK OF NEW SOUTH WALES
CAPACITY: MORTGAGEE
DATE OF CLAIM DOCUMENT: 14/3/90
LODGED BY: 1177B MALLESONS STEPHEN JAQUES
OF 525 COLLINS ST. MELBOURNE
3000
NOTICE TO: AS ABOVE
NO: R69665T
DATE: 30/10/90



Caveat transferred to new C/T

CANCELLED
APPLICATION No. T480766Y
Registered 23-12-94
See Vol.10224 Fol. 410



WHICH IS ISSUED PURSUANT TO
SECTION 31 ACT 6399

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Volume 09815 Folio 962
Folio Creation: Details Unknown
Parent title Volume 08043 Folio 082

STATEMENT END

Paper Title Images

9815/962 - Version 0, Date 06/04/1999

N212875 J

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REGISTER BOOK

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OF TITLES**



VICTORIA

VOL 9815 FOL 962

Certificate of Title

UNDER THE "TRANSFER OF LAND ACT"

EOE (NO.76) PTY. LTD. OF 39TH FLOOR 525 COLLINS STREET MELBOURNE IS THE PROPRIETOR OF AN ESTATE IN FEE SIMPLE SUBJECT TO THE ENCUMBRANCES NOTIFIED HEREUNDER IN- - - ALL THAT PIECE OF LAND IN THE PARISH OF MORANGHURK BEING LOTS 3 AND 4 ON PLAN OF SUBDIVISION NO.27414 AND BEING PART OF CROWN ALLOTMENT 115 WHICH LAND IS SHOWN ENCLOSED BY CONTINUOUS LINES ON THE MAP HEREON THE SAID LAND BEING LIMITED TO SO MUCH AS LIES ABOVE THE DEPTH OF "15.24 METRES" BELOW THE SURFACE- - - - -

FOL 962
VOL 9815

DATE: 24/12/87
DERIVED FROM VOL.8043 FOL.082 N212875J

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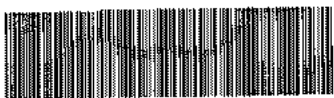
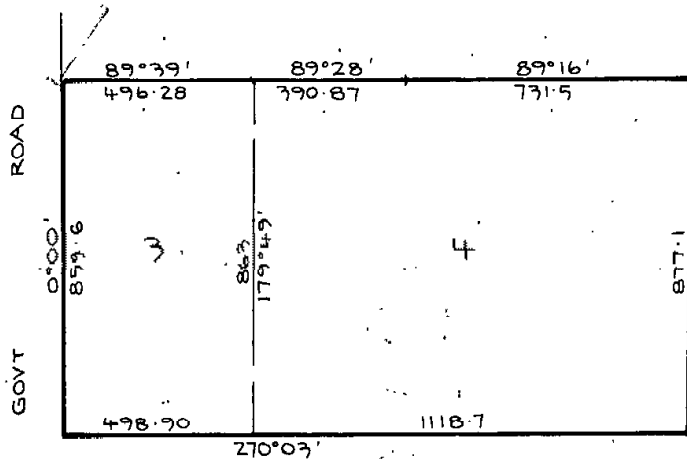
ENCUMBRANCES



[Signature]

Assistant Registrar of Titles

PLAN PC 3574 982 LC
AFFECTS LAND HEREIN



T09815-962-1-2

TOTAL AREA: 140.3 ha
MEASUREMENTS ARE IN METRES

CR



VOL 9815 FOL 962

CAVEAT NO. N727425 LODGED 26 SEP 1988
CAVEAT WITHDRAWN BEFORE ENTRY

16-3-89



MORTGAGE

FROM GEEPORT DEVELOPMENTS PTY. LTD.
(FORMERLY EOE (NO.76) PTY. LTD. TO
NATIONAL MUTUAL ROYAL BANK LIMITED
REGISTERED 16/3/89
P78143E



CAVEAT

CAVEATOR: STATE BANK OF NEW SOUTH WALES
CAPACITY: MORTGAGEE
DATE OF CLAIM DOCUMENT: 8/12/89
LODGED BY: 1177B MALLESONS STEPHEN JAQUES
OF 525 COLLINS ST. MELBOURNE 3000
NOTICE TO: AS ABOVE
NO: P675346B
DATE: 22/2/90
Caveat transferred to new C/T



CAVEAT NO. P35652 LODGED 3 APR 1990

CAVEAT WITHDRAWN BEFORE ENTRY



CAVEAT NO. P961081 LODGED 17 AUG 1990

Caveat transferred to new C/T



CAVEAT NO. R4320 LODGED 17 SEP 1990

Caveat transferred to new C/T



CANCELLED

PURSUANT TO SECTION 24.
SUBDIVISION ACT 1988

REGISTERED. 26/10/93

No. PC 3549820



CANCELLED

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HISTORICAL SEARCH STATEMENT

Land Victoria

Produced 19/08/2016 04:19 PM

Volume 08043 Folio 082
 Folio Creation: Created as paper folio continued as computer folio
 Parent title Volume 06741 Folio 171

RECORD OF HISTORICAL DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged	Dealing Type and Details
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RECORD OF VOTS DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged
27/04/2007	27/04/2007	AF031841M	Y

DISCHARGE OF MORTGAGE
 MORTGAGE(S) REMOVED
 V688601H

04/09/2007	04/09/2007	AF315415Y	Y
------------	------------	-----------	---

TRANSFER OF LAND BY ENDORSEMENT
 FROM:
 IAN DOUGLAS THOMSON
 NOELENE DAWN THOMSON
 TO:
 ELCHO SOUTH PTY LTD

RESULTING PROPRIETORSHIP:
 Estate Fee Simple
 Sole Proprietor
 ELCHO SOUTH of LEVEL 15 200 QUEEN STREET MELBOURNE VIC 3000
 AF315415Y 04/09/2007

04/09/2007	04/09/2007	AF315416W	Y
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MORTGAGE OF LAND
 MORTGAGE AF315416W 04/09/2007
 BENDIGO BANK LTD

25/09/2007	25/09/2007	AF360283J	Y
------------	------------	-----------	---

RECTIFICATION-PROPRIETOR NAME/ADDRESS

RESULTING PROPRIETORSHIP:
 Estate Fee Simple
 Sole Proprietor
 ELCHO SOUTH PTY LTD of LEVEL 15 200 QUEEN STREET MELBOURNE VIC 3000
 AF315415Y 04/09/2007

31/05/2011	31/05/2011	AH981709T	Y
------------	------------	-----------	---

CAVEAT
 CAVEAT AH981709T 31/05/2011
 Caveator
 GEE DEE NOMINEES PTY LTD

Capacity SEE CAVEAT
Lodged by
NORTON GLEDHILL
Notices to
NORTON GLEDHILL of LEVEL 23 459 COLLINS STREET MELBOURNE VIC 3000

STATEMENT END

VOTS Snapshot

Volume 08043 Folio 082
124021551486A
Produced 27/04/2007 01:58 pm

LAND DESCRIPTION

Lot 5 on Plan of Subdivision 027414.
PARENT TITLE Volume 06741 Folio 171
Created by instrument 2622740 10/02/1954

REGISTERED PROPRIETOR

Estate Fee Simple
Joint Proprietors
IAN DOUGLAS THOMSON
NOELENE DAWN THOMSON both of BACCHUS MARSH ROAD CORIO
C640487 16/11/1966

ENCUMBRANCES, CAVEATS AND NOTICES

MORTGAGE V688601H 13/10/1998
NATIONAL AUSTRALIA BANK LIMITED

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan or imaged folio set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE LP027414 FOR FURTHER DETAILS AND BOUNDARIES

Paper Title Images

8043/082 - Version 0, Date 16/10/1999

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THE OFFICE OF TITLES



VICTORIA

Entered in the Register Book

Vol. **8043** Fol. **082**
INDEX PLAN No.208

Certificate of Title

UNDER THE "TRANSFER OF LAND ACT 1928"

16.9.54

Douglas Winston Hodges, Sheep Farmer and Annie Jean Hodges, Married Woman both of
 10 Wimba Avenue Kew are -----
 now the jointproprietors -----
 of an Estate in Fee-simple subject to the Encumbrances notified hereunder in
 the surface and down to the depth of Fifty feet below the surface of ---
 All that piece of Land, delineated and coloured purple on the map in the ---
 margin containing Eight hundred and twenty-six acres One rood and Twenty-seven perches
 or thereabouts being part of Crown Allotment 115 Parish of Moranghurk County of ----
 Grant -----



Dated the Tenth day of February One

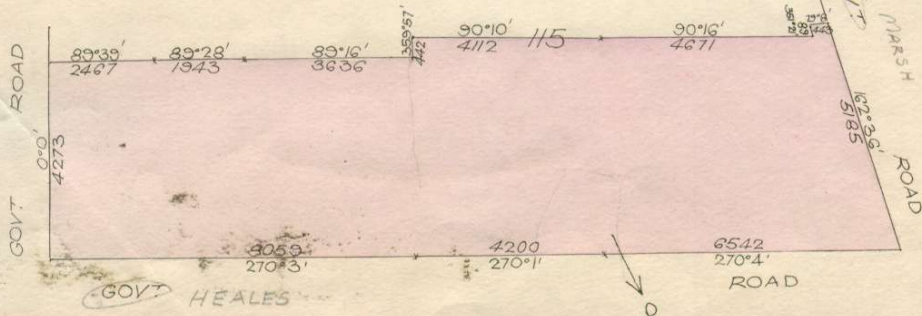
thousand nine hundred and fifty-four.

S. Hewison
Assistant Registrar of Titles

ENCUMBRANCES REFERRED TO

THE WHOLE OR PART OF
THE WITHIN LAND HAS
BEEN SUBDIVIDED AND
REGISTERED PLAN 85480
Miles, Plan
L.P. 27414

85480



THE MEASUREMENTS ARE IN Links

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Vol. 6741 Fol. 171 Transfer 2622740 Application

The Corio Trading Company Proprietary Limited of 164 Moorabool Street Geelong is now the proprietor of the within described estate by transfer registered on 10 Feb. 1954 and numbered 2622741 *A. Hewison*

16. 7. 54 Assistant Registrar of Titles

STATE ELECTRICITY COMMISSION OF VICTORIA has, pursuant to section 17 of Transfer of Land Act 1954, served a Notice of Intention to the compulsory acquisition of part of the land comprised herein. Dated - 6 DEC 1956 Contd. No. 56/50907 (item with letter)

Done W

CREATION OF EASEMENT on 5th November 1958 registered numbered A635746



MORTGAGE to THE COMMERCIAL BANKING COMPANY OF SYDNEY LIMITED Registered 21st January 1959 No. A675645

DISCHARGED 13 SEP 1963



CAVEAT No. B910663 LODGED 22 APR 1964

CAVEAT LAPSED *adding*

IAN DOUGLAS THOMSON Farmer and NOELENE DAWN THOMSON Married Woman both of Bacchus Marsh are now JOINT PROPRIETORS Registered 16th November 1966 No. C640487



MORTGAGE to THE CORIO TRADING COMPANY PROPRIETARY LIMITED Registered 16th November 1966 No. C640488

DISCHARGED 13 SEP 1973



CANCELLED as to part Pursuant to Regulation 12 and Titles issued as set out hereunder on 2nd October 1969

Lots 1 to 2 in Vol 8793 Fol 987 L.P. 85480 to Vol 8793 Fol 988



CAVEAT No. F31858 LODGED 9th OCT 1973 affecting part of the land herein Lots 3 to 5 P/S 27414



CAVEAT WITHDRAWN - 2 DEC 1977



MORTGAGE to THE COMMERCIAL BANKING COMPANY OF SYDNEY LIMITED Registered 7th September 1973 No. B983156

DISCHARGED 13 SEP 1973 Lot 3 P/S 27414



DISCHARGED 31 JAN 1978



MORTGAGE as to part - to GARY LINDSEY BENT and DAVID JOHN BETHBRIDGE Registered 31st August 1977 No. B766630 Lot 3



MORTGAGE to AUSTRALIA AND NEW ZEALAND BANKING GROUP LIMITED Registered 22nd April 1984 No. H950689



CAVEAT No. N56402G LODGED 25 SEP 1987 Affecting part of the land herein Lots 3+4 P/S 27414

CAVEAT LAPSED 25 SEP 1987 9 FEB 1988



CAVEAT No. N10210 LODGED 23 OCT 1987 AFFECTING PART OF THE LAND HEREIN Lots 3+4 P/S 27414 23 OCT 1987

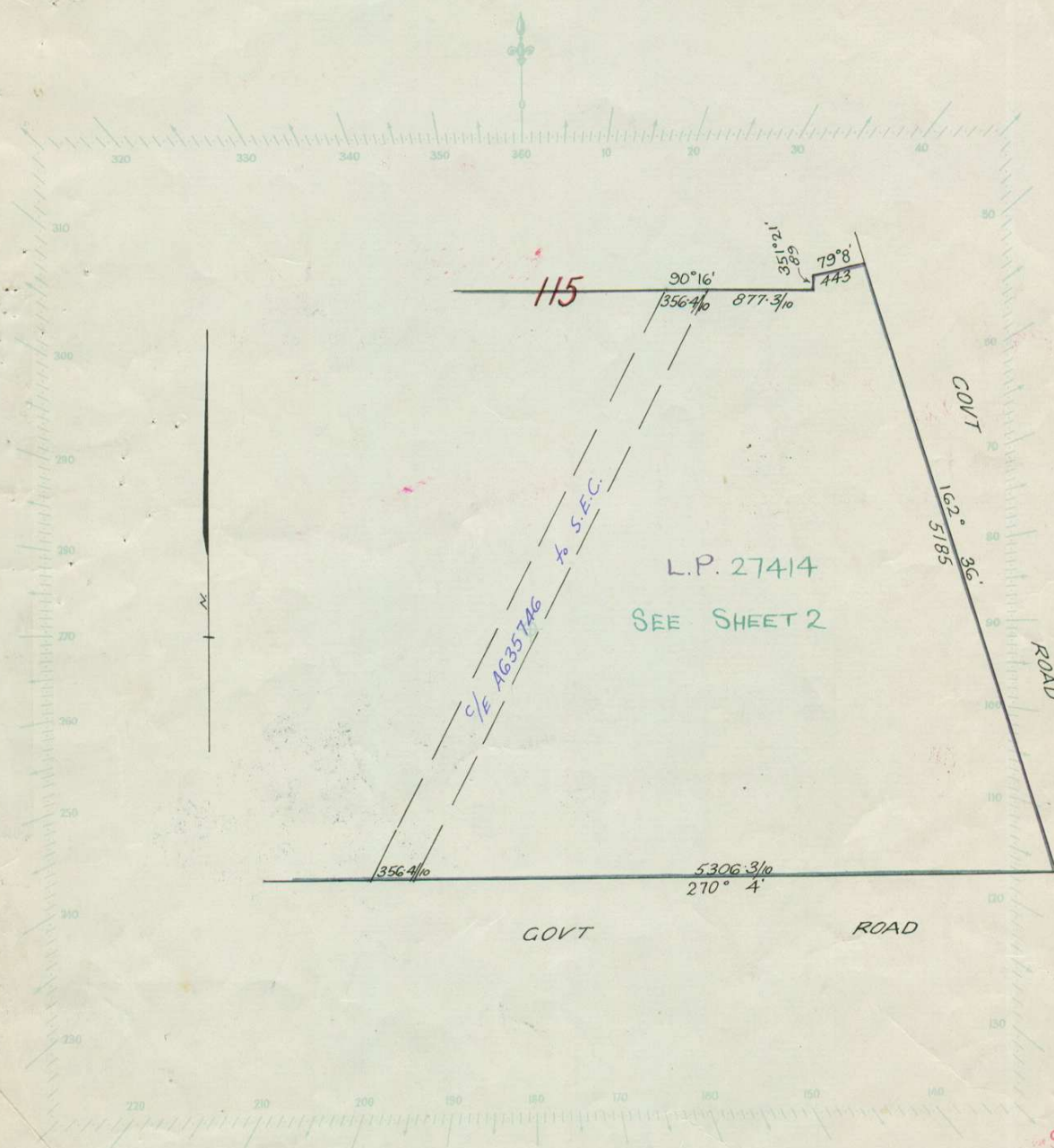


V.8043 F.082




SCALE: 10 chains to one inch.



Vol. 8043 Fol. 082



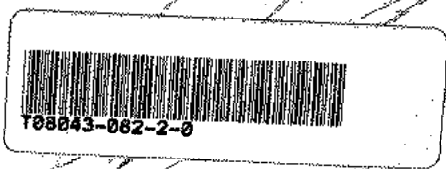
LANDATA - POINTS and DIMENSIONS FOR THIS PLOTTING HAVE BEEN FULLY CONVERTED TO A COMPUTER PLOTTING.

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AGRICULTURE • RESOURCES • CONSERVATION • LAND MANAGEMENT

INTENTIONALLY

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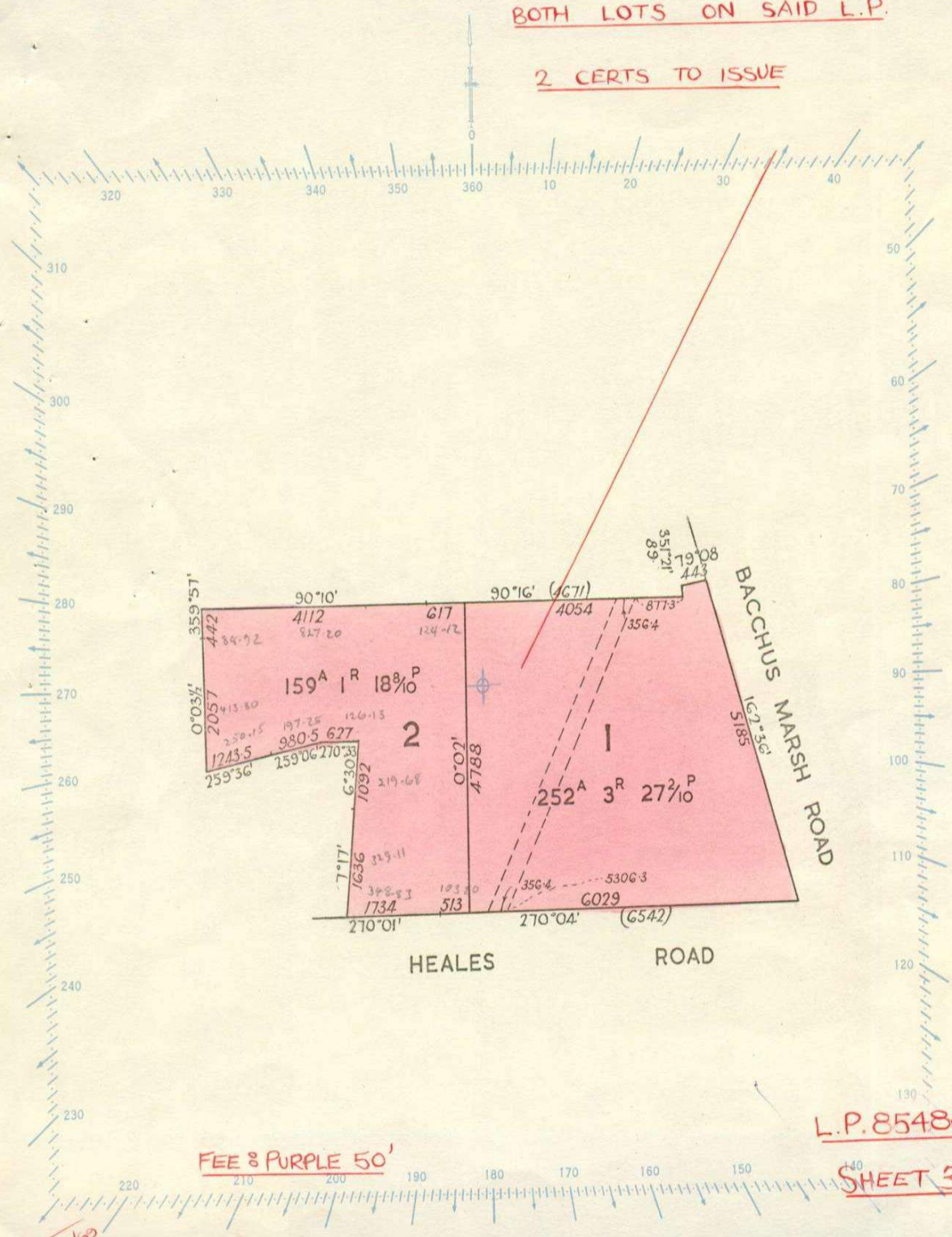
SCALE: to one inch

Volume 8043 Folio 082

L.P. 85480 CANCELS FROM THIS TITLE

BOTH LOTS ON SAID L.P.

2 CERTS TO ISSUE



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FEE 8 PURPLE 50'

L.P. 85480

SHEET 3

GW 19/8/16

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Natural Resources and Environment
AGRICULTURE • RANGELANDS • EDUCATION • LAND MANAGEMENT

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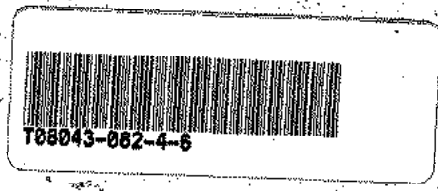


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Natural Resources and Environment
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INTERNATIONALLY

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This is the Sheet marked referred to in the Certificate of Title entered in the Register Book Vol. 8043 Fol. 082

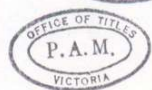
ORIGINAL

Assistant Registrar of Titles

4976(F1)

CAVEAT

CAVEATOR: EOE (NO.76) PTY. LTD.
CAPACITY: PURCHASER/FEE SIMPLE
LODGED BY: 443M BAKER & MCKENZIE OF 525 COLLINS
ST. MELBOURNE 3000
NOTICE TO: AS ABOVE
NO: N189084L
DATE: 11/12/87
LOTS 3 & 4 ON P/S NO.27414



CAVEAT WILL LAPSE ON
REGISTRATION OF N212875 J
24/12/87

TRANSFER AS TO PART No. N212875 J
registered 24-12-87
CANCELLED AS TO PART
See Vol.9815 Fol. 962



LOTS 3 & 4

CAVEAT NO. P935052 LODGED 3 APR 1990

CAVEAT WITHDRAWN BEFORE ENTRY



MORTGAGE
NATIONAL AUSTRALIA BANK LIMITED

V688601H 13/10/98



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Vol. 8043 Fol. 082

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Volume 06741 Folio 171
Folio Creation: Details Unknown

STATEMENT END

Paper Title Images

6741/171 - Version 0, Date 18/09/1999

46/49

Entered in the Register Book
CANCELLED
Vol. 6741 Fol. 1348171
21.5.46

10
157



PARCELS INDEX
SECONDARY STORAGE

J. Sweeney
Assistant Registrar of Titles.

George VI., by the Grace of God of Great Britain Ireland and the British Dominions beyond the Seas KING Defender of the Faith EMPEROR of India

TO all to whom these presents shall come GREETING **Whereas** in conformity with the laws relating to the sale and occupation of Crown lands in Our State of Victoria the **Corporation** hereinafter named has in consideration of the sum of **Fifteen thousand six hundred and fifty-nine pounds and thirteen shillings** which sum has been duly paid become entitled to a grant in fee simple of the surface and down to the depth of **FIFTY** feet below the surface of the land hereinafter described **Now know ye** that in consideration of the sum so paid and in pursuance of the law Us in that behalf enabling We do HEREBY GRANT unto **J.F.GUTHRIE (CORRIEDALE) PROPRIETARY LIMITED** of 1 Malop Street Geelong

so much and such parts as lie above the depth of **FIFTY** feet below the surface of **THAT** PIECE OF LAND in the said State containing one thousand nine hundred and thirty-six acres three roods and two perches more or less being Allotments one hundred and fifteen and one hundred and forty-three in the Parish of Moranghurk County of Grant

delineated with the measurements and abutments thereof in the map drawn in the margin of these presents and therein colored yellow PROVIDED nevertheless that the grantee shall be entitled to sink wells for water and to the use and enjoyment of any wells or springs of water upon or within the boundaries of the said land for any and for all purposes as though he held the land without limitation as to depth EXCEPTING nevertheless unto Us Our heirs and successors all gold and silver and minerals as defined in the *Mines Act* 1928 in upon or under or within the boundaries of the land hereby granted AND ALSO reserving to Us Our heirs and successors free liberty and authority for Us Our heirs and successors and Our and their licensees agents and servants at any time or times hereafter to enter upon the said land and to search and mine therein for gold silver and minerals as aforesaid and to extract and remove therefrom any such gold silver and minerals and to search for and work dispose of and carry away the said gold silver and minerals lying in upon or under the land hereby granted and for the purposes aforesaid to sink shafts make drives erect machinery and to carry on any works and do any other things which may be necessary or usual in mining and with all other incidents that are necessary to be used for the getting of the said gold silver and minerals and the working of all mines seams lodes and deposits containing such gold silver and minerals in upon or under the land hereby granted



T06741-171-1-1

To hold unto the said **J.F.Guthrie (Corriedale) Proprietary Limited**

in fee simple

PROVIDED ALWAYS that the said land is and shall be subject to be resumed for mining purposes under Section 168 of the *Land Act* 1928.

AND PROVIDED also that the said land is and shall be subject to the right of any person being the holder of a miner's right or of a mining lease or mineral lease under the *Mines Act* 1928 or any corresponding previous enactment to enter therein and to mine for gold silver or minerals within the meaning of the said Act and to erect and occupy mining plant or machinery thereon in the same manner and under the same conditions and provisions as those to which such person would for the time being be entitled to mine for gold and silver in and upon Crown lands PROVIDED that compensation shall be paid to the said **J.F.Guthrie (Corriedale) Proprietary Limited**

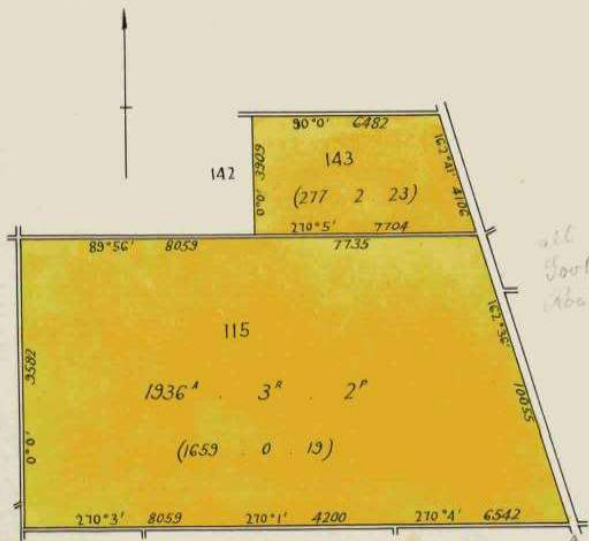
its ~~executors-administrators~~ assigns or transferees by such person for surface damage to be done to such land by reason of mining thereon such compensation to be determined as provided for the time being by law and the payment thereof to be a condition precedent to such right of entry.

Dated in accordance with the provisions of the Land Acts the twenty-second day of August in the year of our Lord One thousand nine hundred and thirty-five being the day the ~~person~~ **Corporation** herein named became entitled to this Grant.

In testimony whereof We have on this sixteenth day of July 1946 caused this Our Grant to be sealed at Melbourne with the Seal of the said State.

Witness Our trusty and well-beloved Lieutenant-General The Honorable SIR EDMUND FRANCIS HERRING, K.B.E., D.S.O., M.C., E.D., Lieutenant-Governor of the said State of Victoria and its Dependencies in the Commonwealth of Australia.

PART OF THE WITHIN LAND IS SHOWN AS A ROAD (AND/OR) GRANT ON L.P. 17141 R.I. NO 557262A



all soil abated
277-2-23
832-2-32
1110-1-15
1659-0-19
826-1-27
832-2-32

L/40
G/748
S.F. Herring

277-2-23
832-2-32
1110-1-15

L.S.

M205 (3)

NOTE—The bearings and measurements are approximately given in this plan. The measurements are in links.

2012/46

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ORIGINAL CROWN GRANT. Not to be dealt with outside the Titles Office.

WARNING

43
28

MORTGAGE TO *Arthur William Hoel and Lewis
Kempthorne Hoel*
 DISCHARGED
 27th Feb 1952
 Assistant Registrar of Titles
 registered
 numbered 856027
J. Sweeney
 Assistant Registrar of Titles

[Handwritten signature]

TRANSFER AS TO PART to *Ernst Friedrich Jenz*
Ernst Jenz and Alan Vernon Jenz
 registered
 on 17 March 1952 numbered 478062
 CANCELLED AS TO PART See Certificate of
 Title Vol. 8002 041
J. Hewison
 Area A R P
 110-1-15 Assistant Registrar of Titles

TRANSFER AS TO BALANCE to
*Douglas Winston Hodges and
Annie Jean Hodges*
 registered
 on 10 Feb. 1954 numbered 2622740
 CANCELLED
 Vol. 8043 082
J. Hewison
 Assistant Registrar of Titles.

**CANCELLED
 SUP. WITH**

14 SEP 1954

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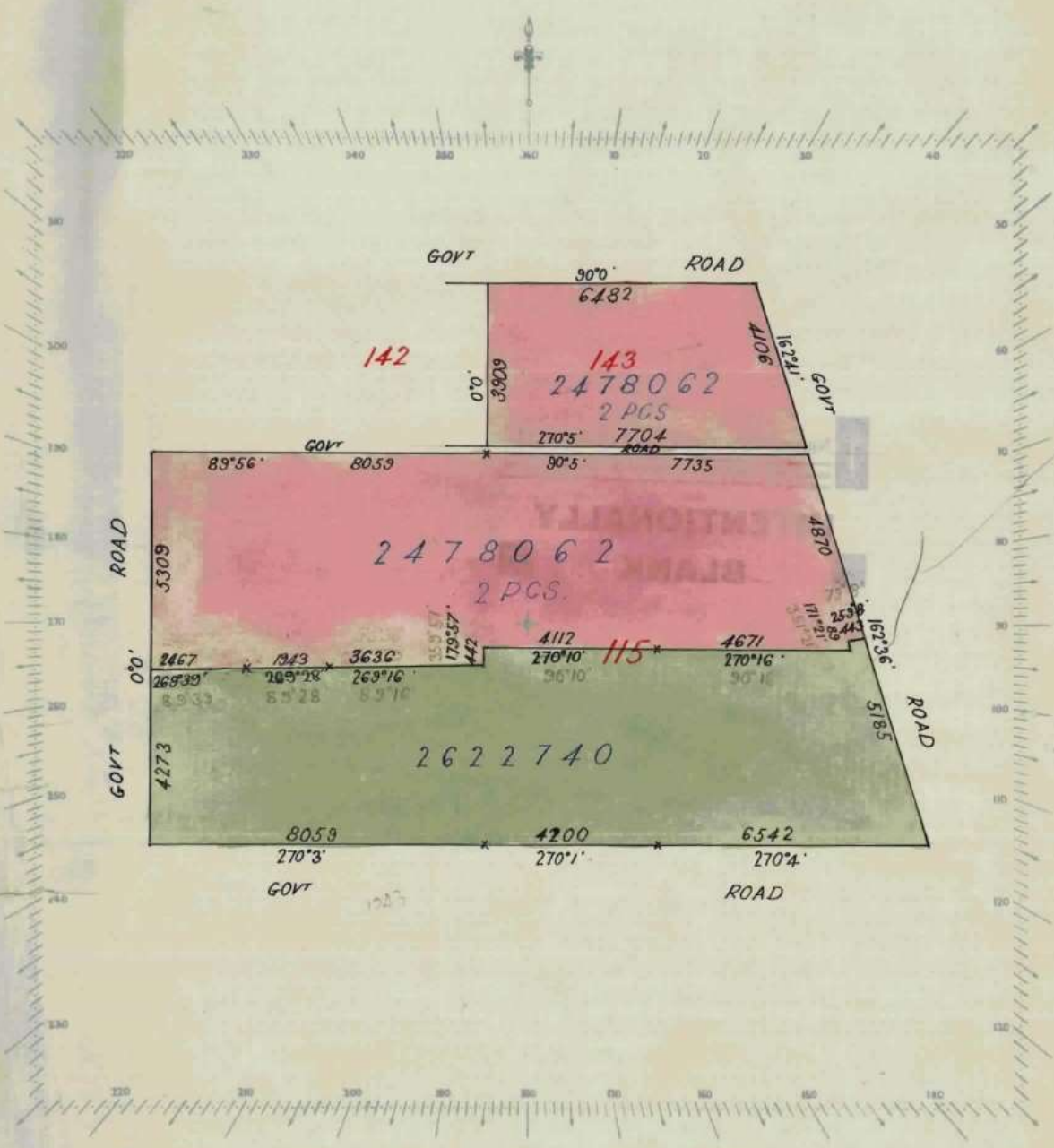
SCALE: 30 chains to one inch.

Vol. 6741 fol. 171.

Delivered on-line by LANDATA®

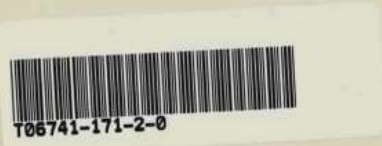
WARNING This document provides an image of a cancelled folio of the Register. It is not a statement from the register of subsisting information in relation to the land to which it refers.

WARNING



FEE PURPLE 50'

1936 - 3 - 2
1110 - 1 - 15
826 1 27




T06741-171-2-0

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HISTORICAL SEARCH STATEMENT

Land Victoria

Produced 02/09/2016 10:19 AM

Volume 11411 Folio 349
Folio Creation: Created as a computer folio

RECORD OF HISTORICAL DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged	Dealing Type and Details
------------------------------	---------------------------	---------	--------	--------------------------

RECORD OF VOTS DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged
17/11/2015	17/11/2015	AM333821Y	N

RECTIFICATION-PROPRIETOR NAME/ADDRESS

RESULTING PROPRIETORSHIP:
Estate Fee Simple
Sole Proprietor
BARWON REGION WATER CORPORATION of 61-67 RYRIE STREET GEELONG VIC 3220
Application No. 128778Q 08/03/2013

STATEMENT END

VOTS Snapshot

VOLUME 11411 FOLIO 349
124045194777V
Produced 21/03/2013 02:31 pm

LAND DESCRIPTION

Lot 1 on Title Plan 951638E.
Created by Application No. 128778Q 08/03/2013

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
BARWON REGION WATER CORPORATION of 61-67 RYRIE STREET GEELONG VIC 3220
Application No. 128778Q 08/03/2013

ENCUMBRANCES, CAVEATS AND NOTICES

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section

HISTORICAL SEARCH STATEMENT

Land Victoria

Page 2 of 2

24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

Warning as to Dimensions

Any dimension and connecting distance shown is based on the description of the land as contained in the General Law Title and is not based on survey information which has been investigated by the Registrar of Titles.

Warning as to subsisting interests

This title is based on General Law documents which have not been investigated by the Registrar of Titles. Subsisting interests under the General Law may affect this title.

DIAGRAM LOCATION

SEE TP951638E FOR FURTHER DETAILS AND BOUNDARIES

HISTORICAL SEARCH STATEMENT

Land Victoria

Produced 02/09/2016 10:38 AM

Volume 10587 Folio 171
 Folio Creation: Created as a computer folio
 Parent title Volume 09785 Folio 357

RECORD OF HISTORICAL DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged	Dealing Type and Details
28/05/2001	04/07/2001	X500742J	Y	AGREEMENT

RECORD OF VOTS DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged
22/11/2005	23/11/2005	AE014560B	Y

WITHDRAWAL OF CAVEAT
 CAVEAT W882426F REMOVED

22/11/2005	23/11/2005	AE014561Y	Y
------------	------------	-----------	---

TRANSFER OF LAND BY ENDORSEMENT
 FROM:
 CHRISTIAN BROTHERS VIC. PROPERTY LIMITED
 TO:
 GEELONG BAPTIST COLLEGE INC

RESULTING PROPRIETORSHIP:
 Estate Fee Simple
 Sole Proprietor
 GEELONG BAPTIST COLLEGE INC of 259 MINE ROAD NUTFIELD VIC 3099
 AE014561Y 22/11/2005

22/11/2005	23/11/2005	AE014562W	Y
------------	------------	-----------	---

MORTGAGE OF LAND
 MORTGAGE AE014562W 22/11/2005
 BAPTIST INVESTMENT & FINANCE LIMITED

10/05/2007	10/05/2007	AF057810D	Y
------------	------------	-----------	---

AGREEMENT SECTION 173 PLANNING AND ENVIRONMENT ACT 1987
 AGREEMENT Section 173 Planning and Environment Act 1987
 AF057810D 10/05/2007

16/05/2011	16/05/2011	AH951938W	N
------------	------------	-----------	---

RECTIFICATION MODIFY MORTGAGE
 MORTGAGE AE014562W 22/11/2005
 BAPTIST INVESTMENTS & FINANCE LTD

23/11/2012	23/11/2012	AK043920F	Y
------------	------------	-----------	---

MORTGAGE OF LAND
 MORTGAGE AK043920F 23/11/2012

BAPTIST FINANCIAL SERVICES LTD

STATEMENT END

VOTS Snapshot

Volume 10587 Folio 171
124016113700M
Produced 23/11/2005 04:46 pm

LAND DESCRIPTION

Lot 2 on Plan of Subdivision 438338T.
PARENT TITLE Volume 09785 Folio 357
Created by instrument PS438338T 12/06/2001

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
CHRISTIAN BROTHERS VIC. PROPERTY LIMITED of TREACY CENTRE 126 THE AVENUE
PARKVILLE 3052
PS438338T 12/06/2001

ENCUMBRANCES, CAVEATS AND NOTICES

CAVEAT W882426F 30/06/2000
Caveator
WINTHROP BAPTIST COLLEGE INC
Capacity PURCHASER
Lodged by
MINTER ELLISON
Notices to
MINTER ELLISON; LEVEL 23 525 COLLINS STREET MELBOURNE 3000

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

AGREEMENT Section 173 PLANNING AND ENVIRONMENT ACT 1987
X500742J 28/05/2001

DIAGRAM LOCATION

SEE PS438338T FOR FURTHER DETAILS AND BOUNDARIES

HISTORICAL SEARCH STATEMENT

Land Victoria

Produced 02/09/2016 10:41 AM

Volume 09785 Folio 357

Folio Creation: Created as paper folio continued as computer folio

Parent titles :

Volume 08996 Folio 214

Volume 09702 Folio 852

RECORD OF HISTORICAL DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged	Dealing Type and Details
12/06/2001	13/06/2001	PS438338T	Y	Cancelled by PS438338T

RECORD OF VOTS DEALINGS

Date Lodged for Registration	Date Recorded on Register	Dealing	Imaged
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STATEMENT END

Paper Title Images

9785/357 - Version 3, Date 10/07/2001

CANCELLED

REGISTER BOOK

VOL. 9785 FOL. 357

ORIGINAL

**NOT TO BE TAKEN FROM THE OFFICE
OF TITLES**



VICTORIA

Certificate of Title

UNDER THE "TRANSFER OF LAND ACT"

TRUSTEES OF THE CHRISTIAN BROTHERS OF MOUNT ST. MARY'S ALBERT ROAD STRATHFIELD NEW SOUTH WALES IS THE PROPRIETOR OF AN ESTATE IN FEE SIMPLE SUBJECT TO THE ENCUMBRANCES NOTIFIED HEREUNDER IN ALL THAT PIECE OF LAND IN THE PARISH OF MORANGHURK BEING THE LAND IN PLAN OF CONSOLIDATION NO.162563A WHICH LAND IS SHOWN ENCLOSED BY CONTINUOUS LINES ON THE MAP ON THE SHEET ANNEXED HERETO - - - - -

ISSUED PURSUANT TO SECTION 97A (2)
OF THE TRANSFER OF LAND ACT 1958
DERIVED FROM VOL.8996 FOL.214 VOL.9702 FOL.852

18 DEC 1987



ASSISTANT REGISTRAR OF TITLES

ENCUMBRANCES

AS TO THE LAND SHOWN MARKED "E-1"
"E-2" "E-5" AND "E-7"

THE EASEMENTS EXISTING OVER THE
SAME BY VIRTUE OF SECTION 98
OF THE TRANSFER OF LAND ACT
SEE PLAN OF SUBDIVISION NO.98240

AS TO THE LAND SHOWN MARKED "E-2"

THE EASEMENT TO THE GEELONG WATERWORKS AND
SEWERAGE TRUST CREATED BY INSTRUMENT C882763

AS TO THE LAND SHOWN MARKED "E-3"

THE EASEMENTS TO THE GEELONG WATERWORKS AND
SEWERAGE TRUST CREATED BY INSTRUMENT K378137

AS TO THE LAND SHOWN MARKED "E-4" AND "E-5"

THE EASEMENT TO THE GEELONG WATERWORKS AND SEWERAGE
TRUST CREATED BY INSTRUMENT J766359

AS TO THE LAND SHOWN MARKED "E-6" AND "E-7"

GEELONG AND DISTRICT WATER BOARD OF RYRIE
ST. GEELONG HAS ACQUIRED AN EASEMENT FOR
WATER SUPPLY PURPOSES OVER PART OF THE
LAND COMPRISED HEREIN SEE INSTRUMENT M998391P

AS TO THE LAND SHOWN MARKED "E-8"

THE EASEMENTS EXISTING OVER THE SAME BY
VIRTUE OF SECTION 98 OF THE TRANSFER OF
LAND ACT SEE PLAN OF SUBDIVISION NO.111005



T09785-357-1-6

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FULLY CONVERTED TITLE

PROPRIETOR

CHRISTIAN BROTHERS VIC PROPERTY LTD.

TREACY CENTRE
126 THE AVENUE
PARKVILLE 3052

W469629P

15/12/99



CAVEAT

CAVEATOR: WINTHROP BAPTIST COLLEGE INC

CAPACITY: PURCHASER/FEE SIMPLE
LODGED BY: MINTER ELLISON

NOTICE TO: LEVEL 23 525 COLLINS STREET
MELBOURNE 3000

LAND DESCRIPTION: SEE CAVEAT
W882426F 30/06/00



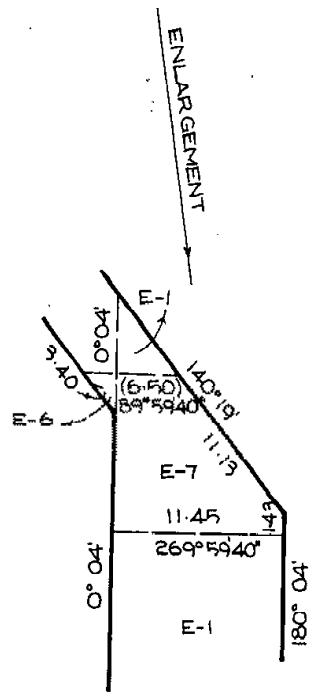
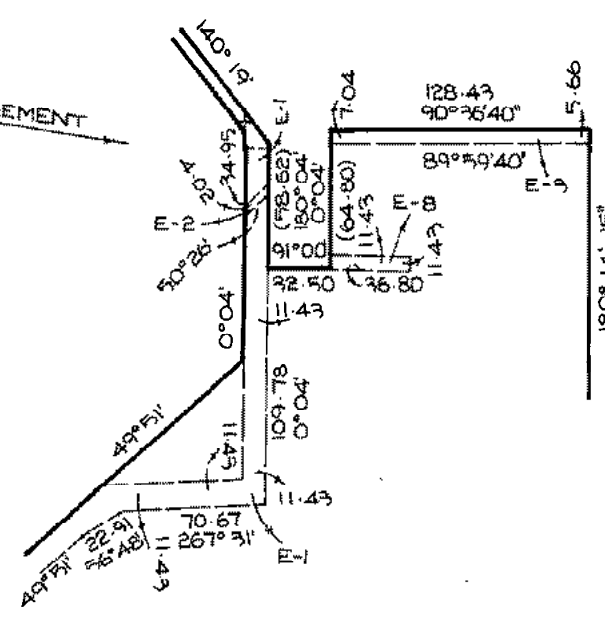
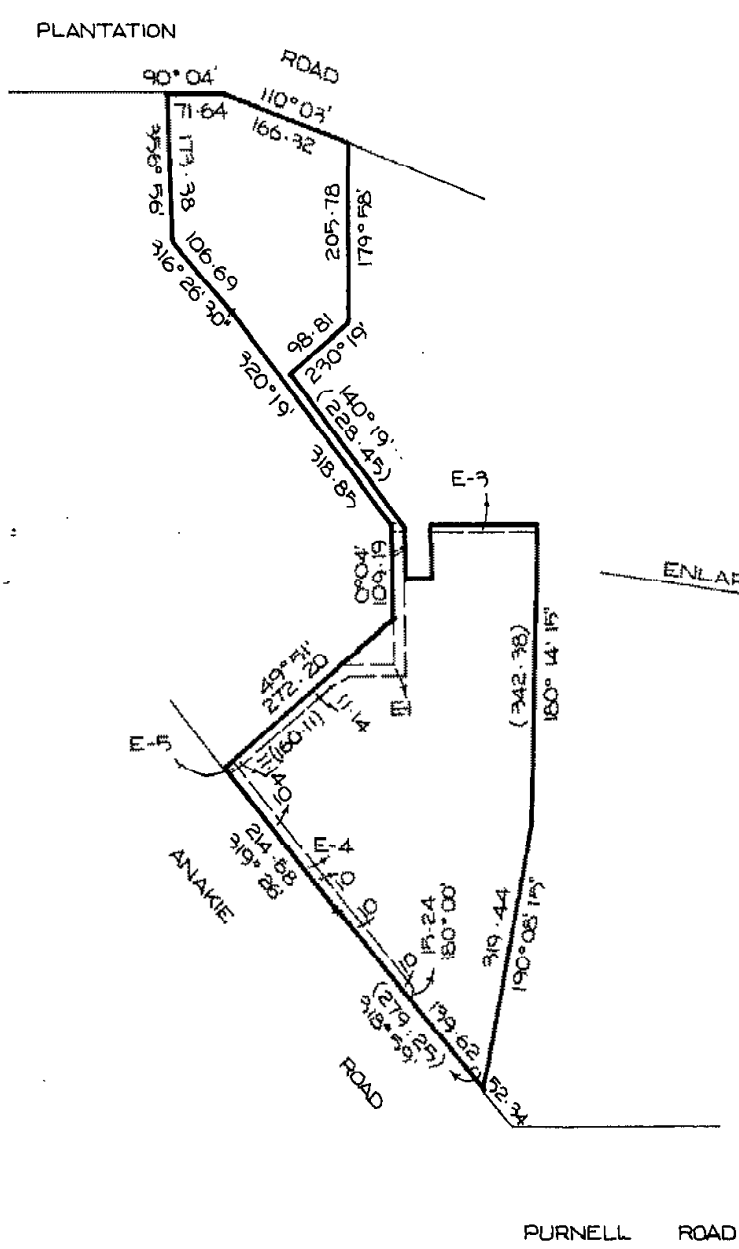
CANCELLED
No. PS 438938 T



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ANNEXED SHEET REFERRED TO IN
CERTIFICATE OF TITLE VOL ~~9785~~ 357



ASSISTANT REGISTRAR OF TITLES



AREA : 19.33 ha
MEASUREMENTS IN METRES

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Volume 09702 Folio 852
Folio Creation: Details Unknown
Parent title Volume 09030 Folio 807

STATEMENT END

Paper Title Images

9702/852 - Version 0, Date 29/03/1999

M276508J

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ORIGINAL

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VICTORIA

REGISTER BOOK

VOL. 9702 FOL. 852

Certificate of Title

UNDER THE "TRANSFER OF LAND ACT"

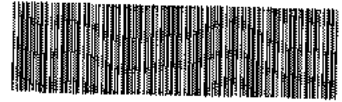
TRUSTEES OF THE CHRISTIAN BROTHERS of Mount St. Mary's Albert Road - - - -
Strathfield New South Wales is the proprietor of an estate in fee simple -
subject to the encumbrances notified hereunder in all that piece of land - -
in the Parish of Moranghurk County of Grant being part of Lot 2 - - - - -
on Plan of Subdivision No. 111005 which land is shown enclosed by - - - - -
continuous lines on the map hereon - - - - -

FOL.

VOL.

AM
NO. M 895 B 29 P 57
28

DATE: 16/5/86
DERIVED FROM VOL. 9030 FOL. 807
M276508J -



T09702-852-1-4

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WARNING

ENCUMBRANCES

~~AS TO THE LAND SHOWN MARKED E-1 AND E-2 RESPECTIVELY THE EASEMENTS TO THE GEELONG WATERWORKS AND SEWERAGE TRUST CREATED BY INSTRUMENTS C882763 AND K378137 RESPECTIVELY~~



P J Gahan
Assistant Registrar of Titles

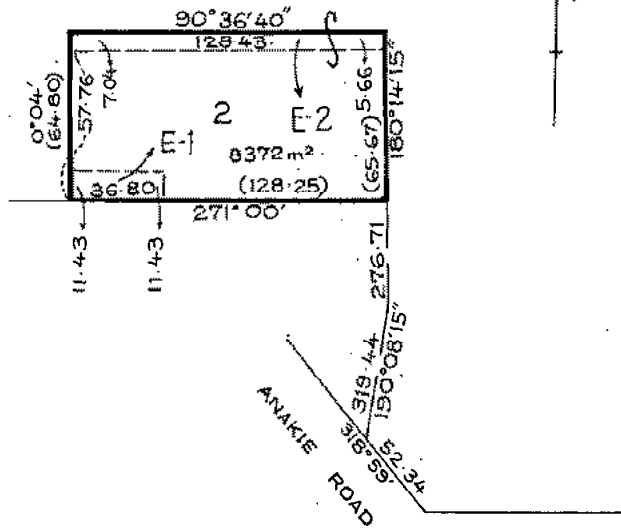
AS TO THE LAND SHOWN MARKED E-1 -

THE EASEMENTS IF ANY EXISTING OVER THE SAME BY VIRTUE OF SECTION 93 OF THE TRANSFER OF LAND ACT.

AS TO THE LAND SHOWN MARKED E-2 -

THE EASEMENTS TO THE GEELONG WATERWORKS AND SEWERAGE TRUST CREATED BY INSTRUMENT N° K378137.

PLAN S.P.162563A..... AFFECTS LAND HEREIN



PURNELL ROAD

MEASUREMENTS ARE IN METRES

VOL. 9702 FOL. 852

CANCELLED

PURSUANT TO PLAN OF CONSOLIDATION

No. C.P. 162563A

Vol. 9785 Fol. 357

18 DEC 1987

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Volume 08996 Folio 214
Folio Creation: Details Unknown
Parent title Volume 06041 Folio 167

STATEMENT END

Paper Title Images

8996/214 - Version 0, Date 08/03/2000

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VICTORIA

CANCELLED

REGISTER BOOK

VOL. 8996

FOL. 214

Certificate of Title

INDEX PLAN No. 69

UNDER THE "TRANSFER OF LAND ACT"

THE ROMAN CATHOLIC TRUSTS CORPORATION FOR THE DIOCESE OF -
MELBOURNE of 383 Albert Street East Melbourne is the -
proprietor of an estate in fee simple subject to the encumbrances -
notified hereunder in ALL THAT piece of land coloured on the ----
map on the sheet annexed hereto being Lot 1 on Plan of -----
Subdivision No.98240 Parish of Moranghurk County of Grant --

Issued under Regulation 12
on the approval of the --
above Plan of Subdivision-

E. Harris



Assistant Registrar of Titles

ENCUMBRANCES REFERRED TO

As to any land coloured blue or purple-hatched

THE EASEMENTS (if any) existing over the same by ----
virtue of Section 98 of the Transfer of Land Act ----

As to any land coloured green

THE RIGHTS to THE GEELONG WATERWORKS AND SEWERAGE -
TRUST under The Grant of Easement registered -----
Book 472 No.562 ---

As to any land coloured purple or purple-hatched

THE EASEMENT to THE GEELONG WATERWORKS AND SEWERAGE-
TRUST created by Instrument C.882763 ----

DERIVED
FROM
VOL. 6041
FOL. 167
26/10/173.

VOL. 8996 FOL. 214

PLAN 48.1625.63A.....
AFFECTS LAND HEREIN

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WARNING

TRUSTEES OF THE CHRISTIAN BROTHERS of
Mount St. Mary's Albert Road Strathfield
New South Wales is now the proprietor
Registered 12th November 1981
No. J711443



CREATION OF EASEMENT

Registered 24th December 1981
No. J766359



GEELONG AND DISTRICT WATER BOARD OF RYRIE
ST. GEELONG HAS ACQUIRED AN EASEMENT FOR
WATER SUPPLY PURPOSES OVER PART OF THE
LAND COMPRISED HEREIN

DATED 20/8/87

ENTERED 12/10/87

M998391P



CANCELLED

PURSUANT TO PLAN OF CONSOLIDATION

No. C.P. 162563A

Sec Vol. 9785 Fols. 357

18 DEC 1987



CANCELLED



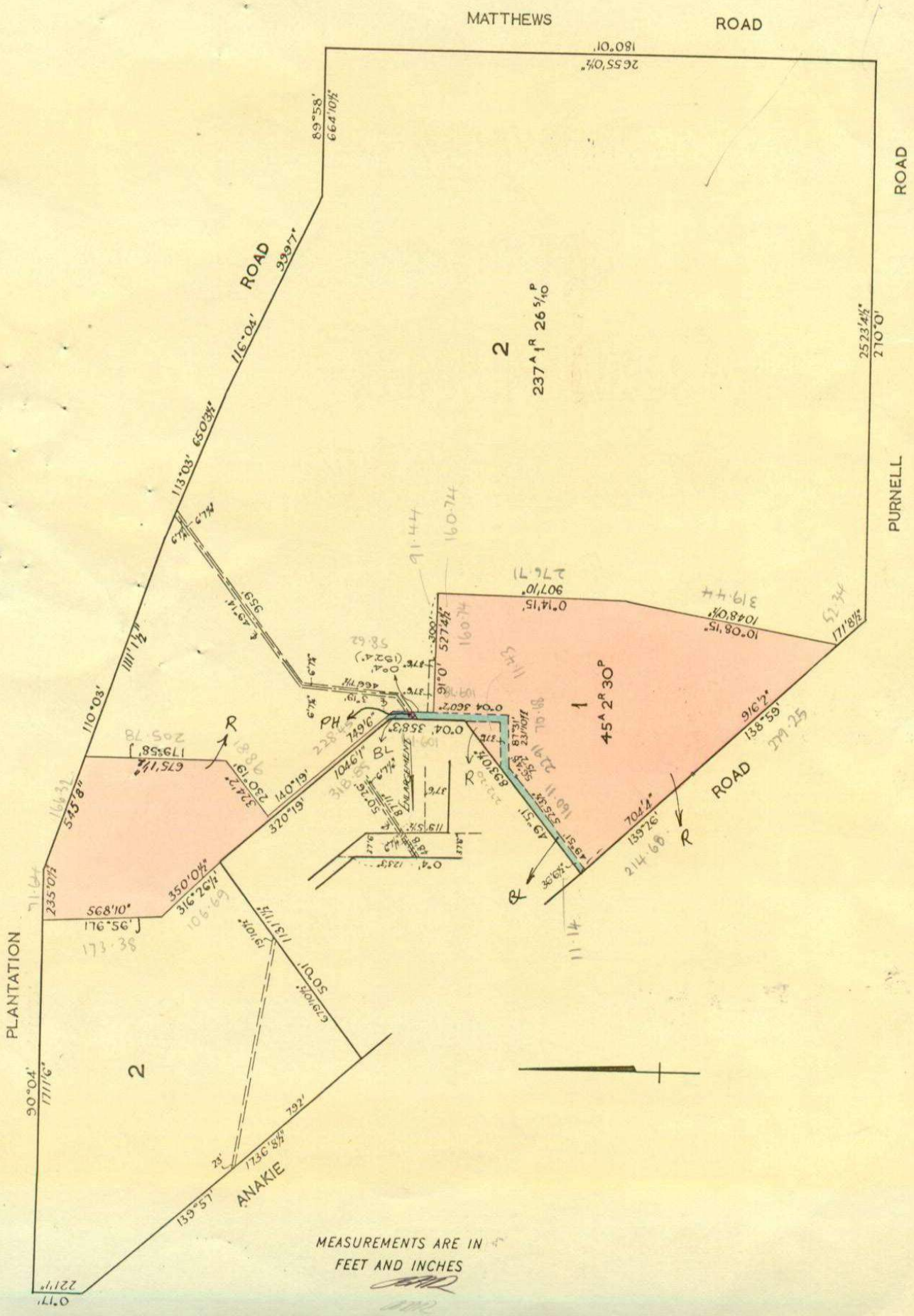
V.8996 F. 214

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ANNEXED SHEET REFERRED TO IN
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E. Harris

ASSISTANT REGISTRAR OF TITLES



MEASUREMENTS ARE IN FEET AND INCHES

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STATEMENTS

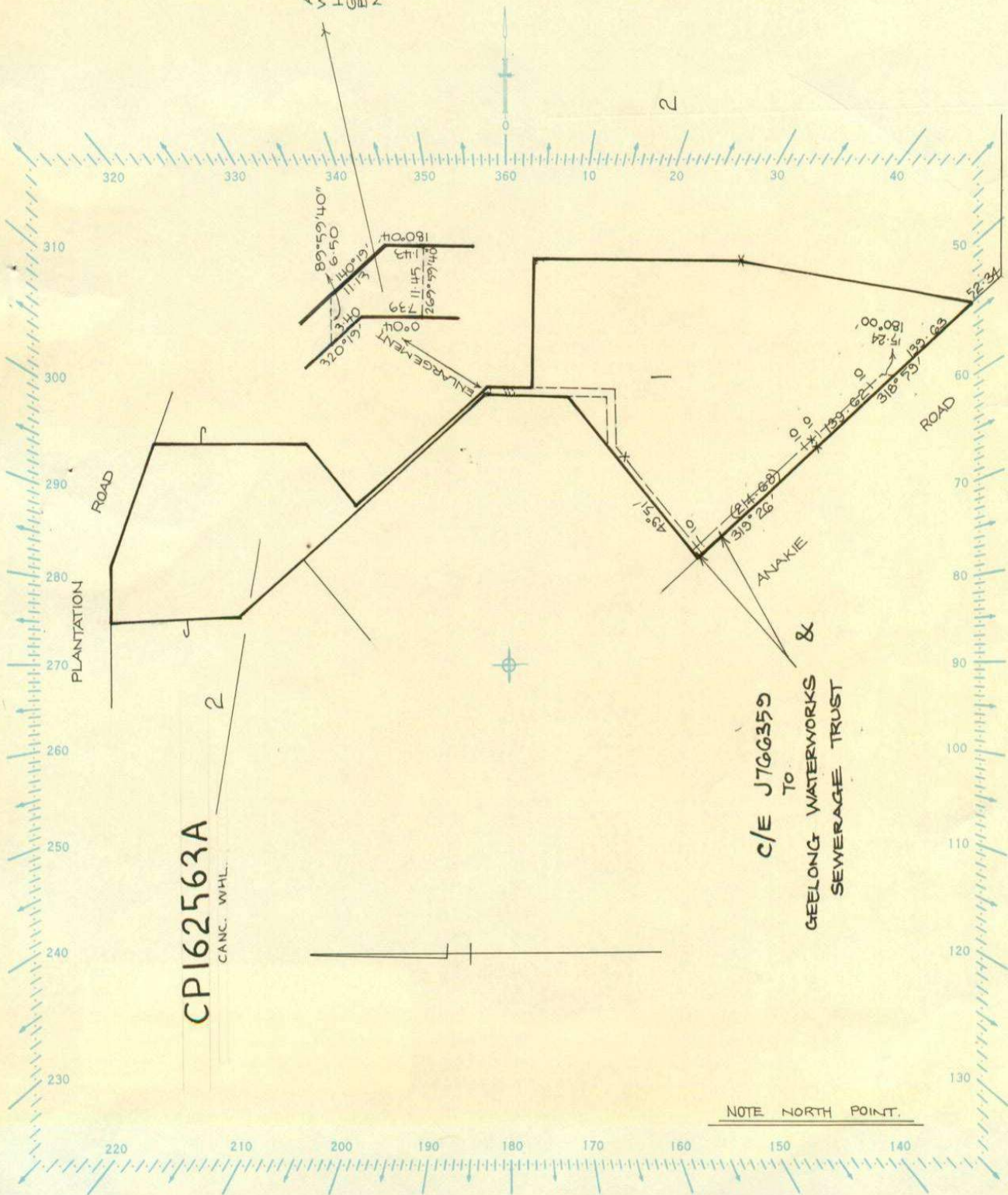


T08996-214-2-1

SCALE

Volume 8996 Folio 214

AN EASEMENT FOR WATER SUPPLY PURPOSES, HAS BEEN ACQUIRED BY GEELONG AND DISTRICT WATER BOARD VIDE NOTIFICATION N/E M998391P.



CPI62563A
CANC. WHL.

c/e J766359
To
GEELONG WATERWORKS &
SEWERAGE TRUST

NOTE NORTH POINT.

PURNELL ROAD

ROAD


ROAD

ANAKIE

PLANTATION

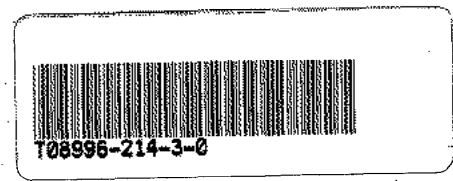
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Volume 06041 Folio 167
Folio Creation: Details Unknown
Parent title Volume 05398 Folio 503

STATEMENT END

Paper Title Images

6041/167 - Version 2, Date 10/01/2001



Entered in the Register Book

CANCELLED

Vol. 6041 Fol. 1208167

VICTORIA.

PARCELS INDEX
EXCESSIVE STORAGE

Certificate of Title,

UNDER THE "TRANSFER OF LAND ACT 1928."

RM

Robert Adam Griffiths of Lovely Banks near Geelong Farmer is - - - - -
now the proprietor of an Estate in Fee-simple, subject to the Encumbrances-
notified hereunder in *All that piece of Land, delineated and coloured-*
red and blue on the map in the margin containing Two hundred and eighty-three acres-
and Eighteen perches or thereabouts being Crown Portions Eighty-five and Eighty-six-
and part of Crown Portions Ninety-six and Ninety-eight Parish of Moranghurk County
of Grant - - - - -

ORIGINAL CERTIFICATE.
Not to be dealt with outside the Titles Office.

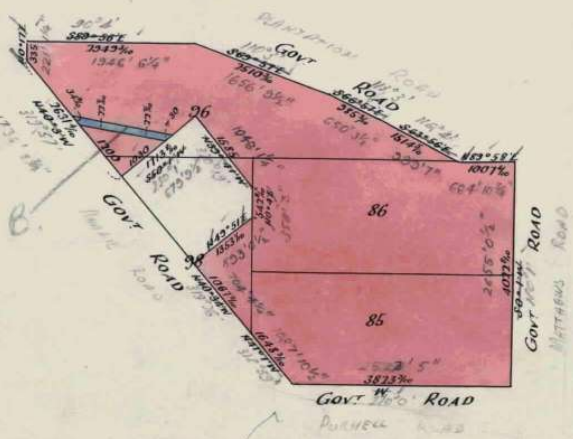
Dated the Twenty-ninth day of April One thousand nine hundred and thirty-six.

J.M. Glenn
Assistant Registrar of Titles.



ENCUMBRANCES REFERRED TO.

As to the land colored blue ---
THE RIGHTS of The Geelong Waterworks & Sewerage Trust under the Grant of Easement registered --
Book 472 No. 562



THE WHOLE, OR PART OF THE WITHIN LAND HAS BEEN SUBDIVIDED SEE Unregistered Plan 98240 M.S. Plan L.P.

J.M. Glenn
The Measurements are in links.



T06041-167-1-0

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Vol. 5398 Fol. 1079503

Transfer. 1610730

Application.

MORTGAGED TO

Clifford Miller Small

DISCHARGED

19 May 1973

registered numbered 725456

J.M. Glenn

Assistant Registrar of Titles

Red Ink No. 4608669 4611267

Robert Adam Griffiths died on 21st February 1947 Probate of his Will was granted to Ramsay Burns Cook. The said Ramsay Burns Cook died on 4th January 1948 Probate of the Will of the said Ramsay Burns Cook has been granted to Isabel Mary Cook of "Braemar" Eastern Beach Seelong Widow
Dated 13th August 1948
K.P. Fitzgerald
Assistant Registrar of Titles

Agnes Jane Griffiths of "Braemar" Lovely Banks Spinster is

now the proprietor of the within described estate by transfer registered on 13th August 1948 and numbered 2158149
K.P. Fitzgerald
Assistant Registrar of Titles

MORTGAGED TO

Eustace Edmund Wilson and Norman Ralph McBlure

DISCHARGED

15th October 1950

registered numbered 955766

H. Hewison

Assistant Registrar of Titles

MORTGAGE

Eustace Edmund Wilson and Norman Ralph McBlure

DISCHARGED

18 OCT 1953

registered numbered 1043399

C. W. Mitchell

Assistant Registrar of Titles

CAVEAT No. B317100 LODGED 17th Nov. 1961

CAVEAT LAPSED 4 DEC 1962

AGNES JANE GRIFFITHS died on 20th January 1961 Probate of her Will has been granted to ALEXANDER DAVID FYFE GRIFFITHS of "Braemar" Lovely Banks Crazier
DATED 16th November 1961
No. B316281



THE TRUSTEES OF THE MARIST FATHERS FOR THE PROVINCE OF AUSTRALIA of 137 Harrington Street Sydney New South Wales are now the proprietors by Transfer B540003
Registered 8th November 1962



CREATION OF EASEMENT

Registered 13th September 1967

No. C882763



THE ROMAN CATHOLIC TRUSTS CORPORATION FOR THE DIOCESE OF MELBOURNE is now the proprietor
Registered 4th September 1972
No. E518144



CANCELLED Pursuant to Regulation 12 and Titles issued as set out hereunder on 26th October 1973

Lots 2 in Vol 8996 Fol 214
LP 98240 to Vol 8996 Fol 215



CANCELLED

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SCALE: 15 CHAINS to one inch

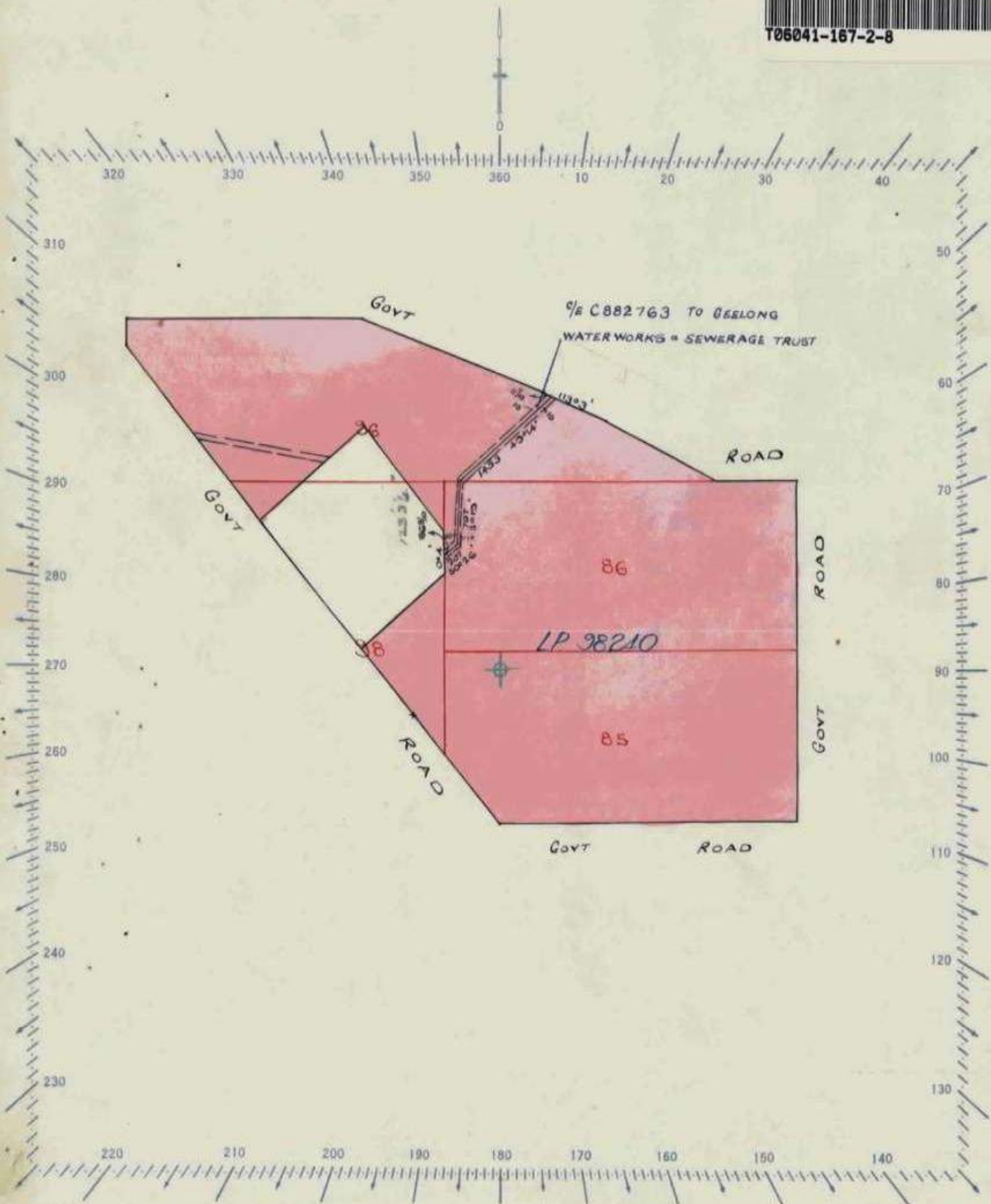
Volume 6041 Folio 167

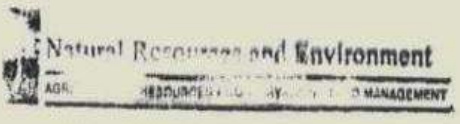
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T06041-167-2-8

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Volume 05398 Folio 503
Folio Creation: Details Unknown

STATEMENT END

Paper Title Images

5398/503 - Version 0, Date 20/10/1999

CANCELLED

Entered in the Register Book



Vol. 5398 Fol. 1079503

VICTORIA.

PARCEL INDEX
REGISTERED

28/8/28

Certificate of Title,

UNDER THE "TRANSFER OF LAND ACT 1915."

AD

David Fyfe Griffiths of Yarra Street Geelong in the County of Grant Solicitor is now the proprietor of an Estate in Fee-simple, subject to the Encumbrances notified hereunder in All that piece of Land, delineated and coloured red and blue on the map in the margin containing Two hundred and eighty-three acres and Eighteen perches or thereabouts being Crown Portions Eighty-five and Eighty-six and part of Crown Portions Ninety-six and Ninety-eight Parish of Moranghurk County of Grant

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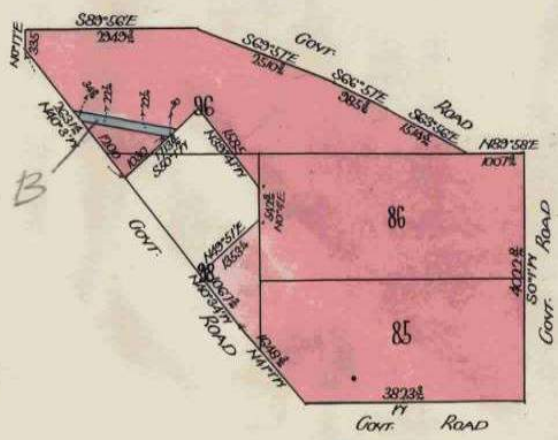
WARNING

Dated the Twenty-second day of August One thousand nine hundred and twenty-eight.

John J. Keane
Assistant Registrar of Titles.

ENCUMBRANCES REFERRED TO.

- (1) THE RIGHTS of persons claiming under the Will of John Cattanach who died on the 8th August 1910
- (2) THE RIGHTS (if any) of Robert Adam Griffiths the purchaser under Contract of Sale dated the 5th February 1920 and numbered 473577 in the Record-Book
- (3) THE RIGHTS (if any) of Cecelia Kinnon the purchaser under Contract of Sale dated the 25th January 1926 and numbered 473581 in the Record Book
- (4) AS to the land colored blue --- THE RIGHTS of The Geelong Waterworks & Sewerage Trust under the Grant of Easement registered Book 472 No. 562



MEMO:
The third encumbrance notified hereon has been removed
Dated 26th Jan 1934
G. Williams
Assistant Registrar of Titles
A11088



T05398-503-1-7

ORIGINAL CERTIFICATE.
Not to be dealt with outside the Titles Office.

The Measurements are in links.

Vol.

Fol.

Transfer.

Application. 4745.8

TRANSFER to

Robert Adam Griffiths

Registered

on *29th April 1936* numbered *610730*

CANCELLED See Certificate of Title

Vol. 6041 Fol. 1208167

J.M. Glenn

Assistant Registrar of Titles

CANCELLED

Delivered
on-line by
LANDATA®

WARNING
This document provides an image of a cancelled folio of the Register. It is not a statement
from the register of subsisting information in relation to the land to which it refers.



APPENDIX B – AERIAL PHOTOGRAPHS

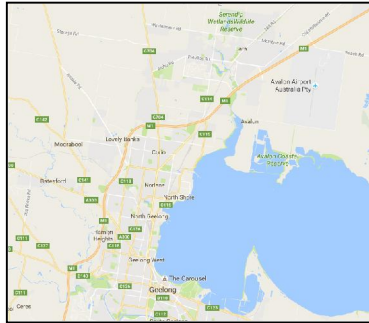
Aerial Imagery Observations

Date	Comments
1947	<ul style="list-style-type: none"> • Seven images were obtained at an approximate scale of 1:15,000 • The Study Area is predominantly covered by vacant, rural land or is utilised for agricultural purposes. Agricultural activities generally appear to be local grazing or low density crops • Several streams are evident in the northern area of the Study Area. No other major surface water features intersect the Study Area • The Study Area confining Staceys, Anakie and Bacchus Marsh Roads exist • The Lovely Banks water storage reservoir exists in the southern area of the Study Area (Anakie Road) and appears to have the same features as its current layout • No heavy industry or evidence of intrusive mining works are indicated by the imagery
1978	<ul style="list-style-type: none"> • Two images were obtained at a scale of 1:25,000 • No significant increase in development within the Study Area is apparent • A small airplane runway and associated building infrastructure has been developed in the southern section of the Study Area, north of Tower Hill Drive • A school facility has been developed adjacent to the Lovely Banks water storage reservoir • Few areas of established trees are visible across the Study Area, with land potentially cleared for grazing
1990	<ul style="list-style-type: none"> • Two colour images were obtained at a scale of 1:25,000 • The Study Area appears to be predominantly covered by dry grassland • Several small surface water dams are apparent, however streams and creeks appear to be dry and may no longer flow or only flow ephemerally • Medium-density residential land use is approaching the south east corner of the Study Area • Land east of the Lovely Banks Monocline has had further development, appearing to be rural urban fringe residential developments
2009	<ul style="list-style-type: none"> • The Geelong Ring Road has been constructed, forming the south eastern boundary of the Study Area • Further rural urban fringe residential development has occurred in the southern section The former airfield appears to have been closed with the building infrastructure demolished • Intensive horticultural operations have been developed, two inside the south western and south eastern boundaries and one outside the north western boundary • Agricultural activities are still apparent in the central area, likely non-intensive crops
2016	<ul style="list-style-type: none"> • No major changes to the Study Area are evident • Some increase in development in the southern and eastern areas is observed • Some light industrial properties have been developed outside the eastern boundary • Material storage and earthworks operations are visible at a site within the north west boundary



**NORTHERN INVESTIGATION AREA
LOVELY BANKS**

**1947 AERIAL
PHOTOGRAPH**



LEGEND

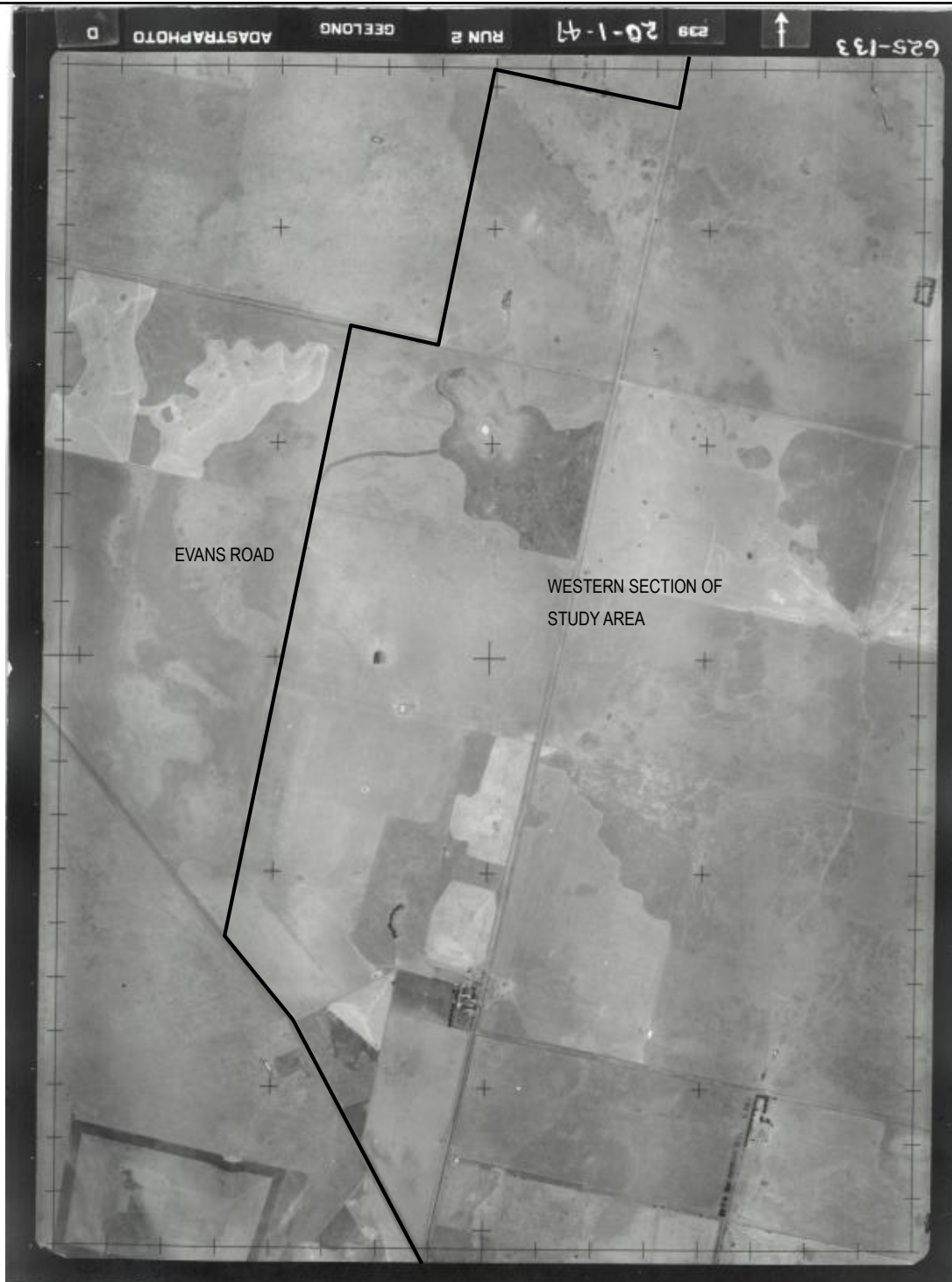
— STUDY AREA BOUNDARY

JOB NO: G3154 AA
DATE: 5 SEPT 2016
DRAWN: JF
CHECKED: GS

COPYRIGHT
 Imagery: Department of Land and Property

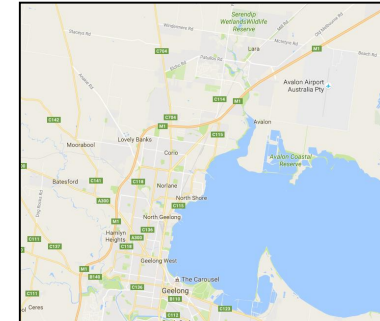


Ground Science



**NORTHERN INVESTIGATION AREA
LOVELY BANKS**

**1947 AERIAL
PHOTOGRAPH**

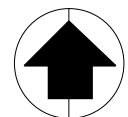


LEGEND

— STUDY AREA BOUNDARY

JOB NO: G3154 AA
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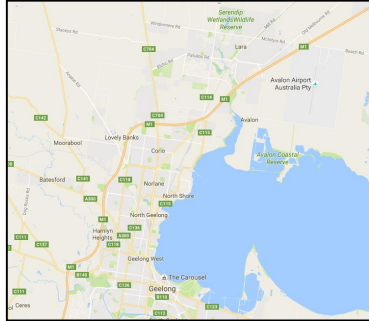


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**NORTHERN INVESTIGATION AREA
LOVELY BANKS**

**1947 AERIAL
PHOTOGRAPH**



LEGEND

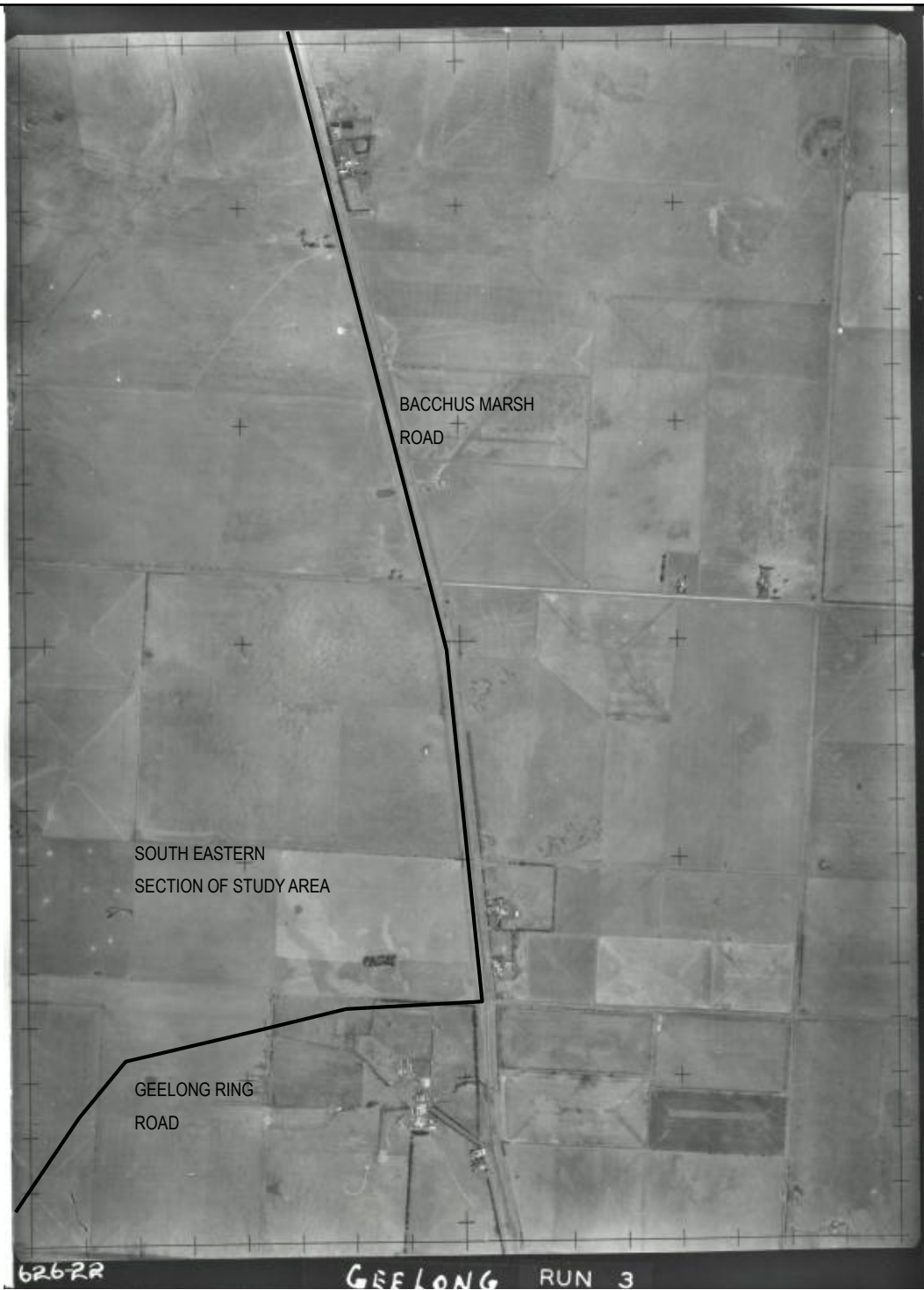
— STUDY AREA BOUNDARY

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DATE: 5 SEPT 2016
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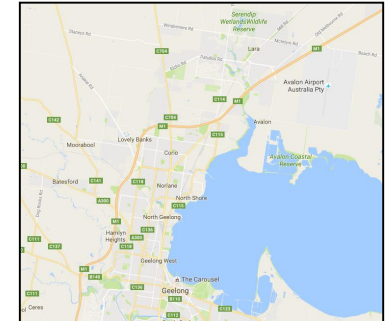


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**NORTHERN INVESTIGATION AREA
LOVELY BANKS**

**1947 AERIAL
PHOTOGRAPH**

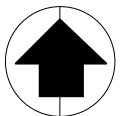


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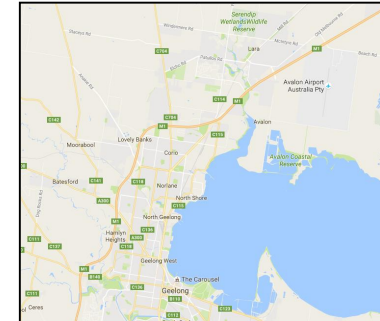


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**NORTHERN INVESTIGATION AREA
LOVELY BANKS**

**1947 AERIAL
PHOTOGRAPH**

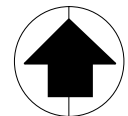


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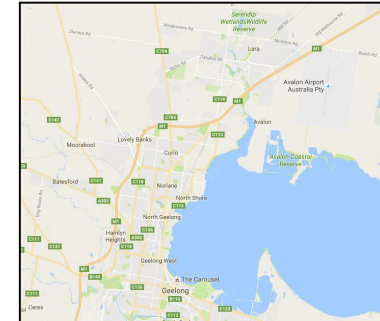


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**NORTHERN INVESTIGATION AREA
LOVELY BANKS**

**1947 AERIAL
PHOTOGRAPH**

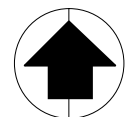


LEGEND

— STUDY AREA BOUNDARY

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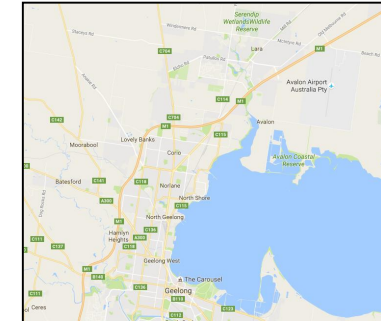


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**NORTHERN INVESTIGATION AREA
LOVELY BANKS**

**1947 AERIAL
PHOTOGRAPH**

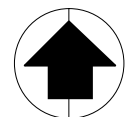


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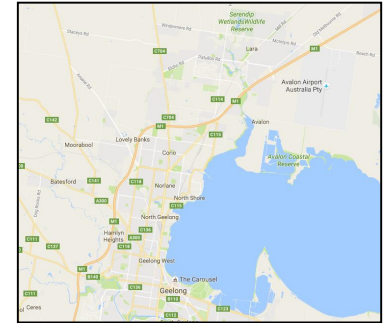


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**NORTHERN INVESTIGATION AREA
LOVELY BANKS**

**1978 AERIAL
PHOTOGRAPH**



LEGEND

— STUDY AREA BOUNDARY

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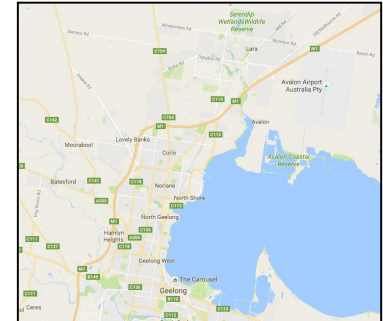


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**NORTHERN INVESTIGATION AREA
LOVELY BANKS**

**1978 AERIAL
PHOTOGRAPH**

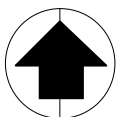


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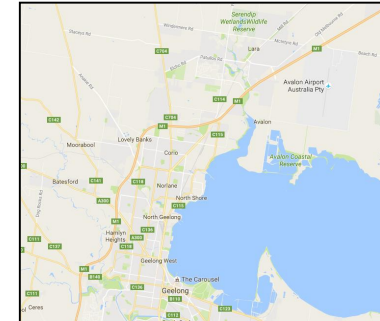
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NORTHERN INVESTIGATION AREA
LOVELY BANKS

1990 AERIAL
PHOTOGRAPH

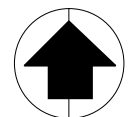


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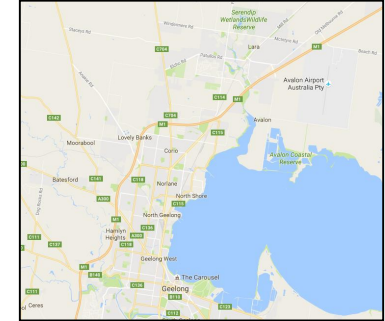
Ground Science





NORTHERN INVESTIGATION AREA LOVELY BANKS

1990 AERIAL PHOTOGRAPH

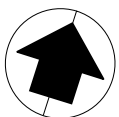


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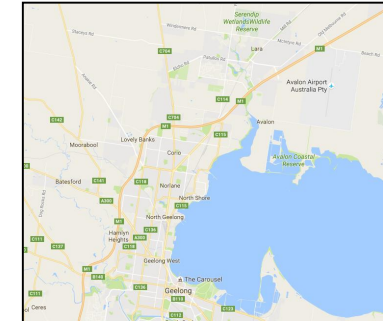


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NORTHERN INVESTIGATION AREA LOVELY BANKS

2009 AERIAL PHOTOGRAPH

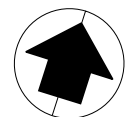


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DATE: 5 SEPT 2016
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APPENDIX C – LANDSLIDE RISK FRAMEWORK

Australian Geomechanics – Vol 42, No1, March 2007 Ref: AGS (2007a)

Guideline for Landslide Susceptibility, Hazard and Risk Zoning for Land Use Planning

Definitions to be attached to landslide susceptibility, hazard and risk zoning for land use planning:

Landslide: The movement of a mass of rock, debris, or earth (soil) down a slope.

Landslide inventory: An inventory of the location, classification, volume, activity and date of occurrence of individual landslides in an area.

Landslide Susceptibility: A quantitative or qualitative assessment of the classification, volume (or area) and spatial distribution of landslides which exist or potentially may occur in an area. Susceptibility may also include a description of the velocity and intensity of the existing or potential landsliding.

Hazard: A condition with the potential for causing an undesirable consequence. The description of landslide hazard should include the location, volume (or area), classification and velocity of the potential landslides and any resultant detached material and the probability of their occurrence within a given period of time. Landslide hazard includes landslides which have their source in the area or may have their source outside the area but may travel on to or regress into the area.

Risk. A measure of the probability and severity of an adverse effect to health, property or the environment. Risk is often estimated by the product of probability and consequences. However, a more general interpretation of risk involves a comparison of the probability and consequences in a non-product form.

For these guidelines risk is further defined as:

- (a) *For life loss*, the annual probability that the person most at risk will lose his or her life taking account of the landslide hazard and the temporal spatial probability and vulnerability of the person.
- (b) *For property loss*, the annual probability of the consequence or the annualised loss taking account of the elements at risk, their temporal spatial probability and vulnerability.

Elements at Risk: The population, buildings and engineering works, economic activities public services utilities, infrastructure and environmental features in the area potentially affected by the landslide hazard.

Vulnerability: The degree of loss to a given element or set of elements within the area affected by the landslide hazards. It is expressed on a scale of 0 (no loss) to 1 (total loss). For property, the loss will be the value of the damage relative to the value of the property; for persons, it will be the probability that a particular life (the element risk) will be lost, given the person(s) is (are) affected by the landslide.

Zoning: The division of land into homogeneous areas or domains and their ranking according to degrees of actual or potential landslide susceptibility, hazard or risk.

In this guideline use of the word 'landslide' implies both existing (or known landslides) and potential landslide which a practitioner might reasonably predict based on the relevant geology, geometry and slope forming processes. Such potential landslide may be on varying likelihood of occurrence.

The term landslip is sometimes used to describe landslide but is not the recommended term.

It is noted that the term "zoning" has particular application by planners in Australia. This document uses the term as it best describes the process and is used internationally. To avoid confusion, those preparing a landslide zoning using this document should always refer to "landslide susceptibility zoning", "landslide hazard zoning" and "landslide risk zoning".



APPENDIX D – PHOTOGRAPHIC LOG



Visual assessment at BH23 – no existing structures



Visual assessment at BH23 – alignment of former airstrip



Visual assessment at BH23 – minor waste materials



Visual assessment at BH26 –
entrance to Lovely Banks Basins



Visual assessment at BH26 –
existing buildings in the south
eastern area



Visual assessment at BH26 –
decommissioned storage basin



Visual assessment at BH26 –
storage basin, subsurface drains
and site coverage



Visual assessment at BH26 –
storage shed and drainage
infrastructure



Visual assessment at BH26 –
drainage basin batters



Materials storage within the
Staceys Road EPA Priority Site



Horticulture operations observed at
20 Tillys Road



Fill placement at borehole location
BH2 in the north western area



Basalt plains facing north east in north western area, Basalt stockpile



Basalt float boulders



Basalt plains in north western area



Borehole 12 facing south, historic erosion identified on north dipping slope



Approximately 150m south west of borehole 11



Borehole 4 – facing west



Basalt outcrop (right) in the northern boundary of site. Photo facing east



Borehole 5, facing south west



Borehole 15 facing west, top of the monocline



Clay (CH), highly reactive, brown,
dry to damp, stiff (borehole 14,
0.5m-0.6m)



Inferred Moorabool Viaduct Sands
(borehole 16)



APPENDIX E – GEOTECHNICAL BOREHOLE LOGS


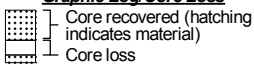
Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 15/11/2016	
Project Name: Northern Investigation Area	Completed: 15/11/2016	
Hole Location: Lovely Banks	Logged By: JM	
Hole Position: 264579.0 m E 5788654.0 m N	Checked By: TH	
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 102.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADM			Not Encountered						CH	Silty CLAY (CH), high plasticity, dark brown/black (inferred residual Newer Volcanic Group)	D	St to VS			0.00: Basalt float and outcrop throughout paddock
						101.5	0.5			Hole Terminated at 0.10 m Refusal					
						101.0	1.0								
						100.5	1.5								
						100.0	2.0								
						99.5	2.5								
						99.0	3.0								
						98.5	3.5								
						98.0	4.0								

DGDTHL3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ --DrawingFile--> 23/12/2016 10:13 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGDTHL 3.05.0 2016-01-20 Proj: DGDTHL 3.05.0 2016-01-20]

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		


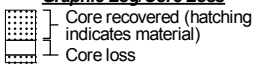
Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 15/11/2016
Project Name: Northern Investigation Area	Completed: 15/11/2016
Hole Location: Lovely Banks	Logged By: JM
Hole Position: 264872.0 m E 5788488.0 m N	Checked By: TH
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°
Hole Diameter:	Bearing: 000°
	RL Surface: 100.00 m
	Datum: Operator: JM

Drilling Information				Soil Description						Observations						
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations	
AD/V		Not Encountered		BH2/1 ES 0.10-0.20 m		99.5	0.5		CL-CI	Silty CLAY (CL-CI), low to medium plasticity, brown mottled grey and white, with basalt gravels and cobbles (uncontrolled fill)	D	St to VS			0.00: Old farm access track	
				ML					Silt (ML), low plasticity, brown, trace clay (buried topsoil)	D	St					
				CI-CH					Silty CLAY (CI-CH), medium to high plasticity, dark brown mottled orange (inferred residual Newer Volcanic Group)	D	St					
				BH2/2 ES 0.90-1.00 m		99.0	1.0			Hole Terminated at 1.05 m Refusal						
						98.5	1.5									
						98.0	2.0									
						97.5	2.5									
						97.0	3.0									
						96.5	3.5									
						96.0	4.0									

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ --DrawingFile--> 23/12/2016 10:13 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 15/11/2016
Project Name: Northern Investigation Area	Completed: 15/11/2016
Hole Location: Lovely Banks	Logged By: JM
Hole Position: 266197.0 m E 5789447.0 m N	Checked By: TH
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°
Hole Diameter:	Bearing: 000°
	RL Surface: 69.00 m
	Datum: Operator: JM

Drilling Information				Soil Description						Observations							
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations		
ADV		Not Encountered		5 D 0.05-0.10 m					CL	Clayey SILT (CL), low plasticity, dark brown (Topsoil)	D	St					
				4 D 0.20-0.50 m					CL-CH	Silty CLAY (CL-CH), medium to high plasticity, dark brown (inferred alluvial deposit)	D	St					
										CL	Clayey SILT (CL), low plasticity, brown, some fine to coarse sand	D	St to VSt				
											GW	Sandy GRAVEL (GW) with rock, fine to coarse, brown, some silt (inferred residual Newer Volcanic Group) sub-rounded/angular gravels	D	D			
										Hole Terminated at 2.20 m Refusal							

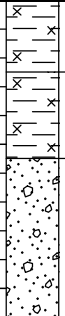
DGDTHL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:13 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGDTHL.3.05.0 2016-01-20 Proj: DGDTHL.3.05.0 2016-01-20]

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p>	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL < PL</p>		



Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 15/11/2016
Project Name: Northern Investigation Area	Completed: 15/11/2016
Hole Location: Lovely Banks	Logged By: JM
Hole Position: 266136.0 m E 5788187.0 m N	Checked By: TH
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°
Hole Diameter:	Bearing: 000°
	RL Surface: 79.00 m
	Datum: Operator: JM

Drilling Information				Soil Description						Observations				
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV		Not Encountered		2 D 0.00-0.20 m		78.5	0.5		CI	Silty CLAY (CI), medium plasticity, dark brown, trace subangular gravels, trace rootlets within top 0.1m (inferred residual Newer Volcanic Group)	D	St	100 200 300 400 500	0.00: 20m west of existing farm dam
				CI-CH					Silty CLAY (CI-CH), medium to high plasticity, dark brown, mottled grey and orange, trace rounded/sub-rounded basalt gravels	D to Dp	St			
				SW					Gravelly sand with rock (SW), fine to coarse, brown/grey	D	VD			
						78.0	1.0			Hole Terminated at 1.10 m Refusal				
						77.5	1.5							
						77.0	2.0							
						76.5	2.5							
						76.0	3.0							
						75.5	3.5							
						75.0	4.0							

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:13 8:30:004 Dargel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]


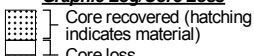
<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 15/11/2016	
Project Name: Northern Investigation Area	Completed: 15/11/2016	
Hole Location: Lovely Banks	Logged By: JM	
Hole Position: 264519.0 m E 5787802.0 m N	Checked By: TH	
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 91.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
														100 200 300 400 500	
AD/V			Not Encountered	1 D 0.10-0.25 m		90.5	0.5		CI-CH CH CI-CH	Silty CLAY (CI-CH), medium to high plasticity, dark brown, trace organics (Topsoil) CLAY (CH), high plasticity, black (inferred residual Newer Volcanic Group) Sandy CLAY (CI-CH), medium to high plasticity, brown/grey mottled white, fine to coarse, trace basalt gravels	D D to Dp	St VSt St			
						90.0	1.0			Hole Terminated at 0.50 m Refusal					
						89.5	1.5								
						89.0	2.0								
						88.5	2.5								
						88.0	3.0								
						87.5	3.5								
						87.0	4.0								


<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		



Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 16/11/2016
Project Name: Northern Investigation Area	Completed: 16/11/2016
Hole Location: Lovely Banks	Logged By: JM
Hole Position: 264918.0 m E 5787802.0 m N	Checked By: TH

Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 97.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV			Not Encountered			96.5	0.5		CH	CLAY (CH), high plasticity, dark brown/black (inferred residual Newer Volcanic Group)	Dp	St			
									GW	Sandy GRAVEL (GW) with rock, fine to coarse, brown/grey	D	D			
										Hole Terminated at 0.55 m Refusal					
						96.0	1.0								
						95.5	1.5								
						95.0	2.0								
						94.5	2.5								
						94.0	3.0								
						93.5	3.5								
						93.0	4.0								

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 16/11/2016		
Project Name: Northern Investigation Area	Completed: 16/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 265137.0 m E 5787090.0 m N	Checked By: TH		
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 32.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations				
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV		Not Encountered				31.5	0.5		CH	CLAY (CH), high plasticity, dark brown (inferred residual Newer Volcanic Group)	D to Dp	St		
						31.0	1.0		GW	Sandy GRAVEL (GW) with rock, brown/grey mottled white, fine to coarse, with weathered basalt gravels	D	D		
						30.5	1.5			Hole Terminated at 1.20 m Refusal				
						30.0	2.0							
						29.5	2.5							
						29.0	3.0							
						28.5	3.5							
						28.0	4.0							

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<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p>	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		


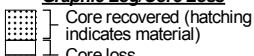
Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016	
Project Name: Northern Investigation Area	Completed: 17/11/2016	
Hole Location: Lovely Banks	Logged By: JM	
Hole Position: 266531.0 m E 5787281.0 m N	Checked By: TH	
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 67.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV		Not Encountered				66.5	0.5		ML	SILT (ML), low plasticity, dark brown, trace organics (topsoil)	D	F			
						66.0	1.0		CI	Silty CLAY (CI), medium plasticity, brown, trace sand (inferred residual Newer Volcanic Group)	D	St			
						65.5	1.5		CL-CI	Sandy CLAY (CL-CI), low to medium plasticity, brown/grey, fine to coarse, with basalt gravels	D	VSt			
						65.0	2.0		CI	Silty CLAY (CI), medium plasticity, brown	D	VSt to H			
						64.5	2.5								
						64.0	3.0			Hole Terminated at 2.70 m Refusal					
						63.5	3.5								
						63.0	4.0								


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<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		


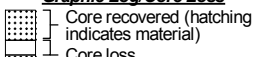
Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016	
Project Name: Northern Investigation Area	Completed: 17/11/2016	
Hole Location: Lovely Banks	Logged By: JM	
Hole Position: 266721.0 m E 5787874.0 m N	Checked By: TH	
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 22.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations				
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV		Not Encountered				21.5	0.5		SW	Gravelly SAND (SW), brown, fine to coarse, trace silt and clay (inferred Moorabool Viaduct Sand)	D	MD to D	100 200 300 400 500	
						21.0	1.0					VD		
						20.5	1.5			Hole Terminated at 1.20 m Refusal				
						20.0	2.0							
						19.5	2.5							
						19.0	3.0							
						18.5	3.5							
						18.0	4.0							

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ --DrawingFile--> 23/12/2016 10:13 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]


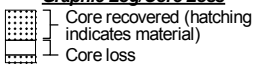
<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016		
Project Name: Northern Investigation Area	Completed: 17/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 266694.0 m E 5787647.0 m N	Checked By: TH		
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 65.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV		Not Encountered				64.5	0.5	X	ML	SILT (ML), low plasticity, dark brown, trace organics (topsoil)	D	F			
						64.0	1.0	X	CI-CH	Silty CLAY (CI-CH), medium to high plasticity, dark brown/black, trace basalt gravels and cobbles (inferred residual Newer Volcanic Group)	Dp to M	St			
						63.5	1.5	X		Dark brown/grey	D				
						63.0	2.0	X		Hole Terminated at 2.00 m Target depth					
						62.5	2.5								
						62.0	3.0								
						61.5	3.5								
						61.0	4.0								

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

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Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016		
Project Name: Northern Investigation Area	Completed: 17/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 266734.0 m E 5787319.0 m N	Checked By: TH		
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 56.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations				
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
AD/V		Not Encountered		13 D 0.40-0.80 m		55.5	0.5		ML	Silt (ML), low plasticity, dark brown (topsoil)	D	F		
						55.0	1.0		CL-CI	Silty CLAY (CL-CI), low to medium plasticity, dark brown/black mottled orange, trace basalt gravels and cobbles (inferred alluvial deposits)	D	St		
						54.5	1.5		CI-CH	CLAY (CI-CH), medium to high plasticity, brown mottled orange, trace sand (inferred residual Newer Volcanic Group)	D	VSt		
						54.0	2.0							
						53.5	2.5			Hole Terminated at 2.50 m Refusal				
						53.0	3.0							
						52.5	3.5							
						52.0	4.0							

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p>	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

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Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 15/11/2016	
Project Name: Northern Investigation Area	Completed: 15/11/2016	
Hole Location: Lovely Banks	Logged By: JM	
Hole Position: 267543.0 m E 5787564.0 m N	Checked By: TH	
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 43.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV		Not Encountered		6 D 0.40-0.70 m		42.5	0.5		CI-CH	Silty CLAY (CI-CH), medium to high plasticity (inferred residual Newer Volcanic Group)	D	St			
						42.0	1.0		GW	Sandy Gravel (GW), light brown, fine to coarse (inferred Moorabool Viaduct Sand)	D	D			
						41.5	1.5		SW	Gravelly SAND (SW), light brown/white, fine to coarse	D	D to VD			
						41.0	2.0		CI	Silty CLAY (CI), medium plasticity, brown/grey mottled orange	D	VSt			
						40.5	2.5		CL	Sandy CLAY (CL), low plasticity, brown mottled orange, yellow and red	D	VSt			
						40.0	3.0			Hole Terminated at 3.10 m Target depth					
						39.5	3.5								
						39.0	4.0								

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p>	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

DGD.TL 3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:13 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL 3.05.0 2016-01-20 Proj: DGD.TL 3.05.0 2016-01-20]

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 16/11/2016	
Project Name: Northern Investigation Area	Completed: 16/11/2016	
Hole Location: Lovely Banks	Logged By: JM	
Hole Position: 265002.0 m E 5787153.0 m N	Checked By: TH	
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 38.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
AD/V			Not Encountered	9 D 0.40-0.80 m		37.5	0.5		CH	CLAY (CH), brown (inferred residual Newer Volcanic Group)					
						37.0	1.0			Grey	D to Dp	St			
						36.5	1.5								
						36.0	2.0								
						35.5	2.5			Hole Terminated at 2.50 m Refusal					
						35.0	3.0								
						34.5	3.5								
						34.0	4.0								

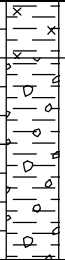
<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p>	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:13 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]


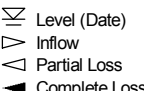
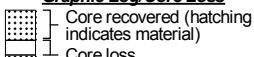
Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 16/11/2016		
Project Name: Northern Investigation Area	Completed: 16/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 266075.0 m E 5786410.0 m N	Checked By: TH		
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 98.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV			Not Encountered			97.5	0.5		CI-CH	Silty CLAY (CI-CH), medium to high plasticity, brown (inferred residual Newer Volcanic Group)	D	F			0.00: Cropped paddock
									CI	Gravelly CLAY (CI), medium plasticity, brown mottled grey/white, fine to coarse, some sand (fine to coarse), with basalt gravels	D	VSt			
						97.0	1.0			Hole Terminated at 0.90 m Refusal					
						96.5	1.5								
						96.0	2.0								
						95.5	2.5								
						95.0	3.0								
						94.5	3.5								
						94.0	4.0								

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:13 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]


<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p> 	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 15/11/2016		
Project Name: Northern Investigation Area	Completed: 15/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 266903.0 m E 5786251.0 m N	Checked By: TH		
Drill Model and Mounting:	Inclination: -90°	RL Surface: 49.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV				BH16/1 ES 0.20-0.30 m					CL	Clayey SILT (CL), low plasticity, dark brown/black (topsoil)	D	F to St			
						48.5	0.5		CI-CH	Silty CLAY (CI-CH), medium to high plasticity, dark brown/black (inferred residual Newer Volcanic Group)	D	St			
						48.0	1.0		CI	Silty CLAY (CI), medium plasticity, brown mottled grey and orange	D	St			
						47.5	1.5		CL-CI	Sandy CLAY (CL-CI), low to medium plasticity, light brown/grey, fine to coarse, trace silt, rounded quartz (inferred Moorabool Viaduct Sand)	D	St			
						47.0	2.0								
						46.5	2.5								
						46.0	3.0		CL	Silty CLAY (CL), low plasticity, white/yellow	D	VSt			
						45.5	3.5								
						45.0	4.0			Hole Terminated at 3.90 m Target depth					

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

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Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016		
Project Name: Northern Investigation Area	Completed: 17/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 268000.0 m E 5786380.0 m N	Checked By: TH		
Drill Model and Mounting:	Inclination: -90°	RL Surface: 28.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
HA		Not Encountered		12 D 0.20-0.60 m		27.5	0.5		CI-CH	Silty CLAY (CI-CH), medium to high plasticity, brown (inferred residual Newer Volcanic Group)	D to Dp	St			
						27.0	1.0		CI-CH	Silty CLAY (CI-CH), medium to high plasticity, grey mottled brown	D				
						26.5	1.5		CH	CLAY (CH), high plasticity, grey, minor white sandy CLAY (CL) lenses	D	VSt			
						26.0	2.0		CL	Sandy CLAY (CL), low plasticity, grey mottled white, fine to coarse (inferred Moorabool Viaduct Sand)	D				
						25.5	2.5		CH	CLAY (CH), high plasticity, grey mottled brown	D	VSt to H			
						25.0	3.0								Hole Terminated at 2.60 m Refusal
						24.5	3.5								
						24.0	4.0								

DGD.TL 3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:13 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL 3.05.0 2016-01-20 Proj: DGD.TL 3.05.0 2016-01-20]

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p>	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016
Project Name: Northern Investigation Area	Completed: 17/11/2016
Hole Location: Lovely Banks	Logged By: JM
Hole Position: 264293.0 m E 5785410.0 m N	Checked By: TH

Drill Model and Mounting:	Inclination: -90°	RL Surface: 74.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
HA			Not Encountered			73.5	0.5		CI-CH	Silty CLAY (CI-CH), medium to high plasticity, dark brown mottled grey, trace gravels (inferred residual Newer Volcanic Group)	D to Dp	St			
						73.0	1.0					VSt to H			
						72.5	1.5			Hole Terminated at 1.30 m Refusal					
						72.0	2.0								
						71.5	2.5								
						71.0	3.0								
						70.5	3.5								
						70.0	4.0								

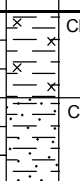
DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:14 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p>	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		


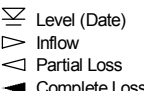
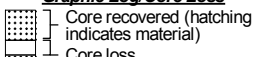
Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016	
Project Name: Northern Investigation Area	Completed: 17/11/2016	
Hole Location: Lovely Banks	Logged By: JM	
Hole Position: 265164.0 m E 5787929.0 m N	Checked By: TH	
Drill Model and Mounting:	Inclination: -90°	RL Surface: 86.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
HA			Not Encountered			85.5	0.5		CI-CH CL-CI	Silty CLAY (CI-CH), medium to high plasticity, dark brown, trace organics (inferred residual Newer Volcanic Group) Sandy CLAY (CL-CI), low to medium plasticity, brown/grey mottled white, fine to coarse, trace basalt gravels,	D to Dp D	St VSt H			
						85.0	1.0			Hole Terminated at 0.60 m Refusal					
						84.5	1.5								
						84.0	2.0								
						83.5	2.5								
						83.0	3.0								
						82.5	3.5								
						82.0	4.0								

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:14 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p> 	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		


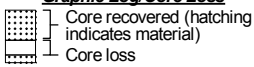
Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 16/11/2016		
Project Name: Northern Investigation Area	Completed: 16/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 265921.0 m E 5785017.0 m N	Checked By: TH		
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 96.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV		Not Encountered				95.5	0.5		ML	Clayey SILT (ML), low plasticity, brown, trace organics (topsoil)	D	St			
								CI-CH	Silty CLAY (CI-CH), medium to high plasticity, brown (inferred residual Newer Volcanic Group)	D					
								CL-CI	Sandy CLAY (CL-CI), low to medium plasticity, brown mottled grey and white, weathered basalt gravels	D	St to VSt				
						95.0	1.0			Hole Terminated at 1.00 m Refusal		H			
						94.5	1.5								
						94.0	2.0								
						93.5	2.5								
						93.0	3.0								
						92.5	3.5								
						92.0	4.0								

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:14 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 16/11/2016		
Project Name: Northern Investigation Area	Completed: 16/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 266835.0 m E 5785130.0 m N	Checked By: TH		
Drill Model and Mounting:	Inclination: -90°	RL Surface: 34.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
AD/V			Not Encountered			33.5	0.5		CI-CH	Silty CLAY (CI-CH), medium to high plasticity, brown (disturbed natural soil)	D to Dp	F		100 200 300 400 500	0.00: Cropped paddock
						33.0	1.0		CH	CLAY (CH), high plasticity, brown, some sand, fine to coarse (inferred residual Newer Volcanic Group)					
						32.5	1.5			Grey	Dp	St			
						32.0	2.0								
						31.5	2.5								
				10 D 2.60-3.00 m		31.0	3.0		CI	Silty CLAY (CI), medium plasticity, yellow brown, trace siliceous gravels, trace to minor sand (inferred Moorabool Viaduct Sand)	D to Dp	St to VSt			
						30.5	3.5			Hole Terminated at 3.50 m Target depth					
						30.0	4.0								

Method AS - Auger Screwing RR - Rock Roller WB - Washbore	Penetration No resistance ranging to refusal	Water Level (Date) Inflow Partial Loss Complete Loss	Samples and Tests U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test	Moisture Condition D - Dry M - Moist W - Wet	Consistency/Relative Density VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
Support C - Casing	Graphic Log/Core Loss Core recovered (hatching indicates material) Core loss	Classification Symbols and Soil Descriptions Based on Unified Soil Classification System	Plastic Limit < PL = PL > PL		

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 16/11/2016
Project Name: Northern Investigation Area	Completed: 16/11/2016
Hole Location: Lovely Banks	Logged By: JM
Hole Position: 267529.0 m E 5785617.0 m N	Checked By: TH

Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 22.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV		Not Encountered		11 D 0.50-0.80 m		21.5	0.5		CL	Clayey SILT (CL), low plasticity, brown/grey (topsoil)	D to Dp	F			
						21.0	1.0		CI	CLAY (CH), medium plasticity, grey, trace gravels (inferred Moorabool Viaduct Sand)	D to Dp	St to VSt			
						20.5	1.5		CL	Sandy CLAY (CL), low plasticity, grey/white, some rounded cherty gravels	D	VSt			
						20.0	2.0		CH	CLAY (CH), high plasticity, very stiff to hard	Dp	VSt to H			
						19.5	2.5		CH	CLAY (CH), high plasticity, very stiff to hard	Dp	VSt to H			
						19.0	3.0			Hole Terminated at 2.70 m Target depth					
						18.5	3.5								
						18.0	4.0								

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p>	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		


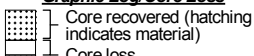
DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:14 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016		
Project Name: Northern Investigation Area	Completed: 17/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 267652.0 m E 5784715.0 m N	Checked By: TH		
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 23.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations						
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations	
ADV		Not Encountered				22.5	0.5		CL-CI	Silty CLAY (CL-CI), low to medium plasticity, dark brown (inferred Moorabool Viaduct Sand)	D	St				
						22.0			SW	Gravelly SAND (SW) with rock, light grey/white, fine to coarse	D	VSt				
						22.0	1.0		GW	Sandy GRAVEL (GW) with rock, light grey/white, fine to coarse, some basalt gravels, trace silt	D	D to VD				
						21.5	1.5			Hole Terminated at 1.30 m Refusal						
						21.0	2.0									
						20.5	2.5									
						20.0	3.0									
						19.5	3.5									
						19.0	4.0									

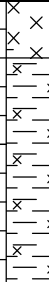
<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:14 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]


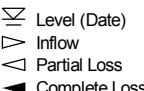

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016		
Project Name: Northern Investigation Area	Completed: 17/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 264976.0 m E 5784273.0 m N	Checked By: TH		
Drill Model and Mounting:	Inclination: -90°	RL Surface: 80.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations				
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
HA		Not Encountered				79.5	0.5		CL	Clayey SILT (CL), low plasticity, brown, trace rounded quartz gravels (topsoil)	D	St		
						79.0	1.0		CI-CH	Silty CLAY (CI-CH), medium to high plasticity, dark brown, trace basalt gravels (inferred residual Newer Volcanic Group)	D to Dp	St to VSt		
						78.0	2.0			Hole Terminated at 1.00 m Refusal				
						77.5	2.5							
						77.0	3.0							
						76.5	3.5							
						76.0	4.0							

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:14 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p> 	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		


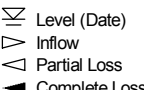
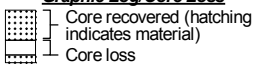
Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 17/11/2016		
Project Name: Northern Investigation Area	Completed: 17/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 266421.0 m E 5783714.0 m N	Checked By: TH		
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 33.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
HA		Not Encountered				32.5	0.5		CI-CH	Silty CLAY (CI-CH), medium to high plasticity, dark brown, trace organics (inferred residual Newer Volcanic Group)	D	St			
						32.0	1.0		CH	CLAY (CH), high plasticity, grey	Dp	St to VSt			
						31.5	1.5			Hole Terminated at 1.40 m Refusal					
						31.0	2.0								
						30.5	2.5								
						30.0	3.0								
						29.5	3.5								
						29.0	4.0								

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<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p> 	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		

Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 15/11/2016	
Project Name: Northern Investigation Area	Completed: 15/11/2016	
Hole Location: Lovely Banks	Logged By: JM	
Hole Position: 266945.0 m E 5784289.0 m N	Checked By: TH	
Drill Model and Mounting: ATS Drill Rig	Inclination: -90°	RL Surface: 23.00 m
Hole Diameter:	Bearing: 000°	Datum: Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
ADV			Not Encountered	7 D 0.05-0.10 m		23.00	0.0	X	CL	Clayey SILT (CL), low plasticity, brown/grey (Topsoil)	D	F to St			
						22.5	0.5	X	CI-CH	Silty CLAY (CI-CH), medium to high plasticity, brown, trace gravels (inferred residual newer volcanic group)	D to Dp	St to VSt			
						22.0	1.0	X	CH	CLAY (CH), high plasticity, brown/grey Basalt gravels	D to Dp	St to H			
						21.5	1.5	X	CL-CI	Sandy CLAY (CL-CI) with rock, grey mottled white	D				
						21.0	2.0	X	CH	CLAY (CH), high plasticity, grey	D to Dp	VSt			
						20.5	2.5	X							
						20.0	3.0	X		Hole Terminated at 3.00 m Target depth					
						19.5	3.5	X							
						19.0	4.0	X							

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p>	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p>	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		


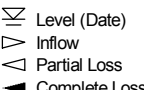
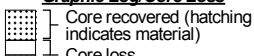
Engineering Log - Borehole

Project No.: G3154

Client: LB Rezoning C/- Wilcon Projects	Commenced: 15/11/2016		
Project Name: Northern Investigation Area	Completed: 15/11/2016		
Hole Location: Lovely Banks	Logged By: JM		
Hole Position: 266027.0 m E 5782469.0 m N	Checked By: TH		
Drill Model and Mounting:	Inclination: -90°	RL Surface: 31.00 m	
Hole Diameter:	Bearing: 000°	Datum:	Operator: JM

Drilling Information				Soil Description						Observations					
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency	Relative Density	Hand Penetrometer UCS (kPa)	Structure and Additional Observations
HA		Not Encountered		8 D 0.10-0.40 m		30.5	0.5		CI-CH	Silty CLAY (CI-CH), medium to high plasticity, dark brown (potential fill)	Dp to M	St			
						30.0	1.0		CI	Sandy CLAY (CI), medium plasticity, brown mottled white (inferred Moorabool Viaduct Sand)	Dp	F to St			
						29.5	1.5		CL-CI	Silty CLAY (CL-CI), low to medium plasticity, brown	D	St			
						29.0	2.0			Hole Terminated at 1.70 m Refusal					
						28.5	2.5								
						28.0	3.0								
						27.5	3.5								
						27.0	4.0								

DGD.TL.3.05.0 LIB.GLB Log IS AU BOREHOLE 1 G3154 BH LOGS.GPJ ->DrawingFile>> 23/12/2016 10:14 8:30:004 Dangel Lab and in Situ Tool - DGD [Lib: DGD.TL.3.05.0 2016-01-20 Proj: DGD.TL.3.05.0 2016-01-20]

<p>Method</p> <p>AS - Auger Screwing RR - Rock Roller WB - Washbore</p>	<p>Penetration</p> <p>No resistance ranging to refusal</p> 	<p>Water</p> <p>Level (Date) Inflow Partial Loss Complete Loss</p> 	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test</p>	<p>Moisture Condition</p> <p>D - Dry M - Moist W - Wet</p>	<p>Consistency/Relative Density</p> <p>VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense</p>
<p>Support</p> <p>C - Casing</p>	<p>Graphic Log/Core Loss</p> <p>Core recovered (hatching indicates material) Core loss</p> 	<p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Plastic Limit</p> <p>< PL = PL > PL</p>		



APPENDIX F – LABORATORY PHYSICAL RESULTS

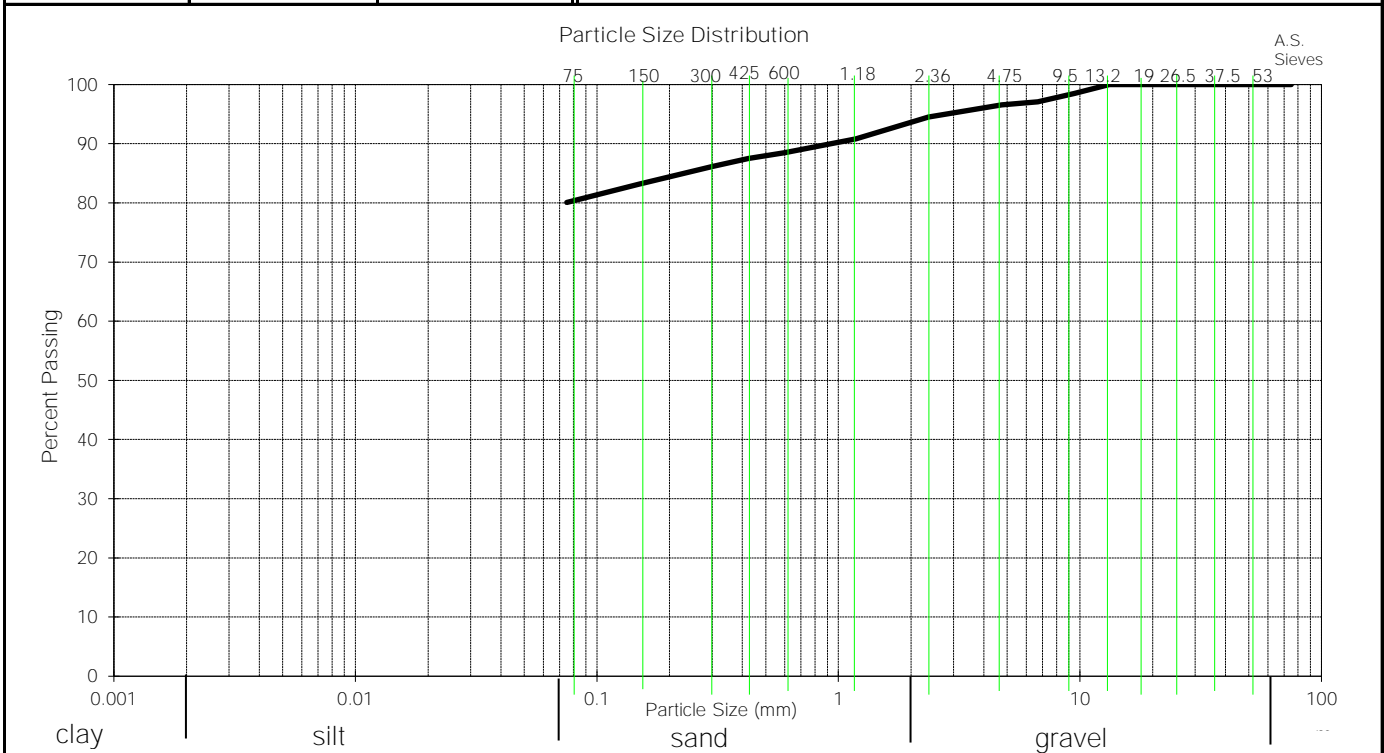


A C N 105 704 078

13 Brock Street, Thomastown, VIC P 03 9464 4617 F 03 9464 4618

Client:	IB REZONING C/- WILCON PROJECTS	Job No.:	G3154
Project:	NORTHERN INVESTIGATION AREA	Test Date:	23-Nov-16
Location:	LOVELY BANKS	Report No.:	AA
Lab Reference No.:	#3	Sample Identification:	BH4 @ 0.25 - 0.5m
Laboratory Specimen Classification:		CLAY, high plasticity, dark brown, trace sand, trace gravel.	

Particle Size Distribution AS1289 3.6.1			Consistency Limits and Moisture Content			
Sieve Size	% Passing	Specification	Test	Method	Result	Spec.
150 mm	100		Liquid Limit	% AS1289 3.1.2	90	
75 mm	100		Plastic Limit	% AS1289 3.2.1	28	
53 mm	100		Plasticity Index	% AS1289 3.3.1	62	
37.5 mm	100		Linear Shrinkage	% AS1289 3.4.1	17.0	
26.5 mm	100		Moisture Content	% AS1289 2.1.1	27.3	
19.0 mm	100		Sample History:			Oven Dried
13.2 mm	100		Preparation Method:			Dry sieved
9.5 mm	98		Crumbling / Curling of linear shrinkage:			Cracking & Curling
6.7 mm	97		Linear shrinkage mould length:			250 mm
4.75 mm	97		ND = not determined NO = not obtainable NP = non plastic			
2.36 mm	95		Moisture / Dry Density Relationship		AS 1289 5.2.1	
1.18 mm	91		Maximum Dry Density:		t/m ³	
600 um	89		Optimum Moisture Content:		%	
425 um	87		Notes			
300 um	86		Sampled by J. Menzies 16/11/2016			
150 um	83					
75 um	80					



Date: 30/11/2016



NATA Accredited Laboratory No. 15055
 Accredited for compliance with ISO/IEC 17025
 The results of the tests, calibrations and/or
 measurements in this document are traceable to
 Australian/National Standards

Chris Senserrick
 Approved Signatory



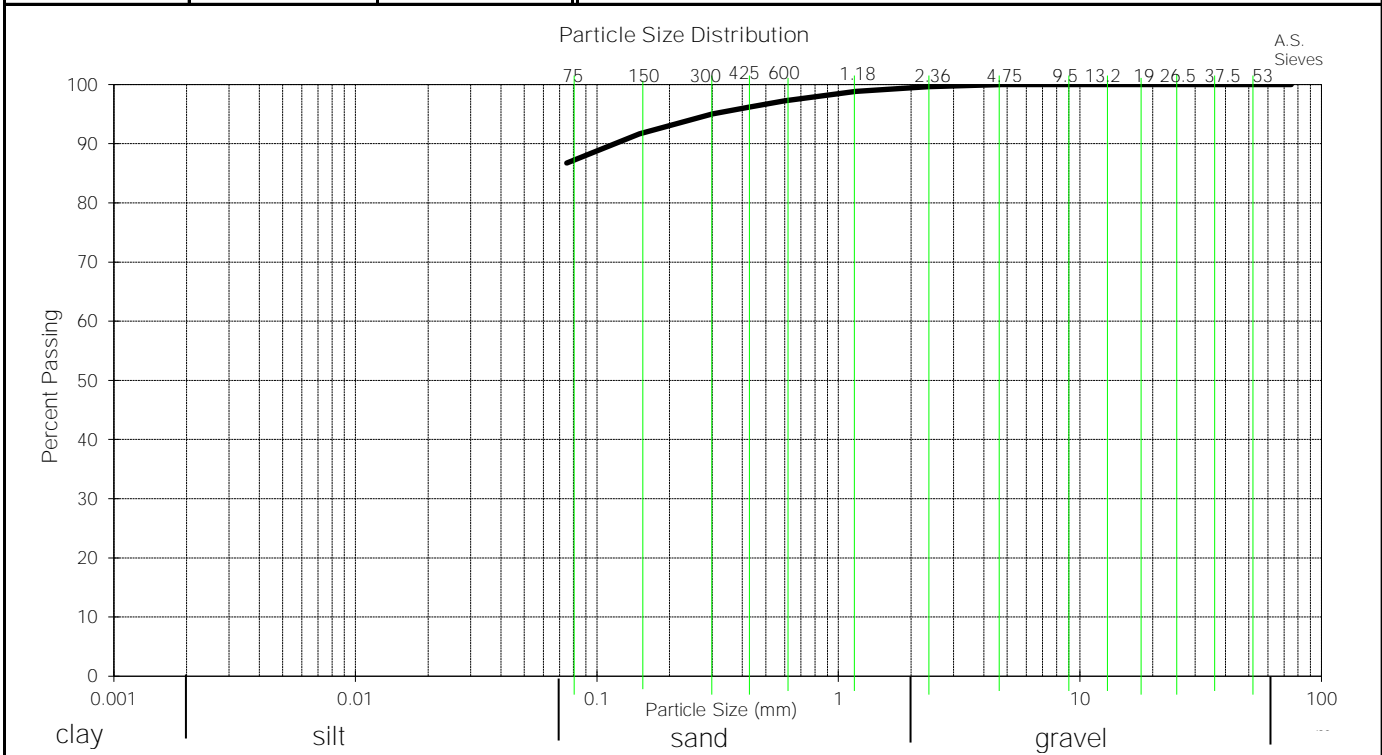
Particle Size Distribution & Atterberg Limits Test Report

A C N 105 704 078

13 Brock Street, Thomastown, VIC P 03 9464 4617 F 03 9464 4618

Client: IB REZONING C/- WILCON PROJECTS	Job No. G3154.1
Project: NORTHERN INVESTIGATION AREA	Test Date: 30-Nov-16
Location: LOVELY BANKS	Report No. AD
Lab Reference No. #4	Sample Identification: BH3 @ 0.2 - 0.5m
Laboratory Specimen Classification: CLAY, high plasticity, black, trace sand.	

Particle Size Distribution AS1289 3.6.1			Consistency Limits and Moisture Content			
Sieve Size	% Passing	Specification	Test	Method	Result	Spec.
150 mm	100		Liquid Limit	% AS1289 3.1.2	69	
75 mm	100		Plastic Limit	% AS1289 3.2.1	26	
53 mm	100		Plasticity Index	% AS1289 3.3.1	43	
37.5 mm	100		Linear Shrinkage	% AS1289 3.4.1	15.5	
26.5 mm	100		Moisture Content	% AS1289 2.1.1	26.4	
19.0 mm	100		Sample History: Oven Dried			
13.2 mm	100		Preparation Method: Dry sieved			
9.5 mm	100		Crumbing / Curling of linear shrinkage: Cracking & Curling			
6.7 mm	100		Linear shrinkage mould length: 250 mm			
4.75 mm	100		ND = not determined NO = not obtainable NP = non plastic			
2.36 mm	100		Moisture / Dry Density Relationship AS 1289 5.2.1			
1.18 mm	99		Maximum Dry Density: t/m ³			
600 um	97		Optimum Moisture Content: %			
425 um	96		Notes Sampled by J. Menzies 16/11/2016			
300 um	95					
150 um	92					
75 um	87					



Date: 6/12/2016



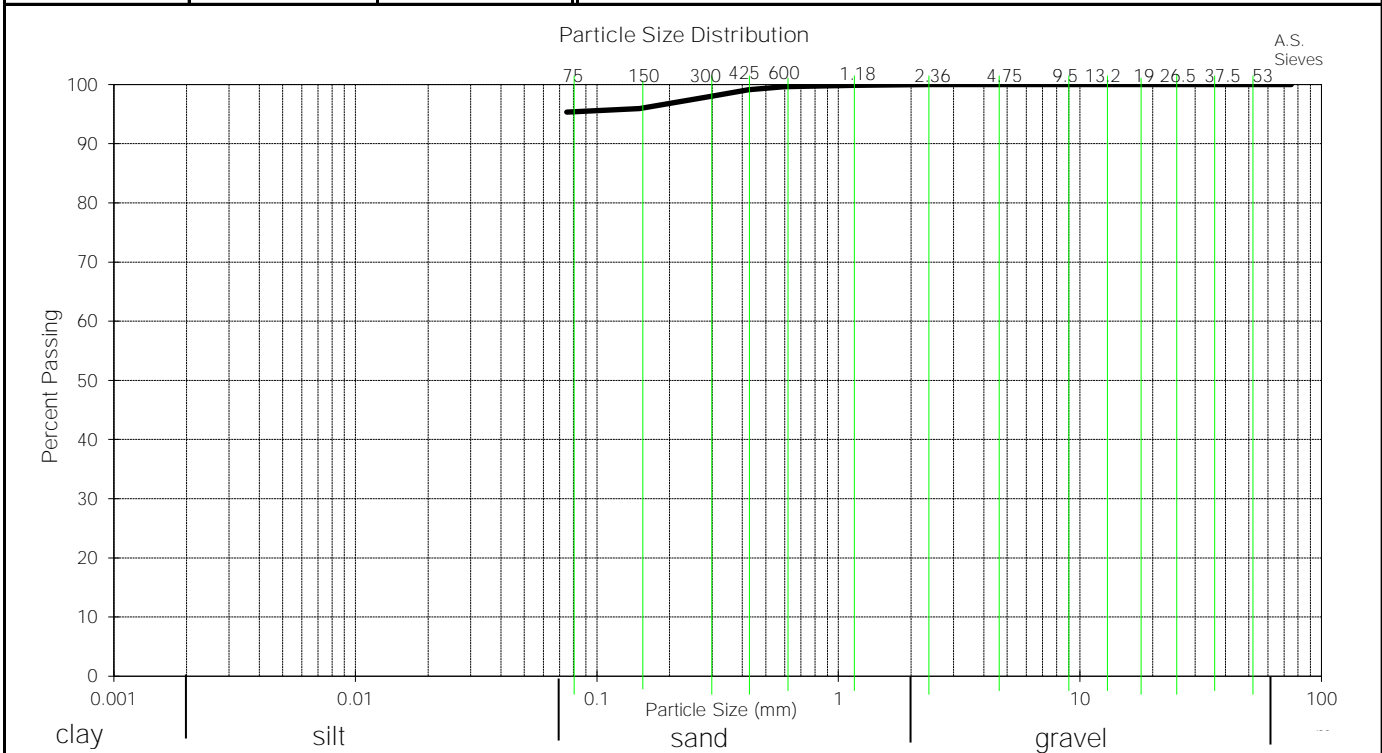
NATA Accredited Laboratory No. 15055
 Accredited for compliance with ISO/IEC 17025
 The results of the tests, calibrations and/or
 measurements in this document are traceable to
 Australian/National Standards

Chris Senserrick
 Approved Signatory *[Signature]*



Client:	IB REZONING C/- WILCON PROJECTS	Job No.:	G3154
Project:	NORTHERN INVESTIGATION AREA	Test Date:	23-Nov-16
Location:	LOVELY BANKS	Report No.:	AB
Lab Reference No.:	#9	Sample Identification:	BH14 @ 0.4 - 0.8m
Laboratory Specimen Classification: CLAY, high plasticity, grey, trace sand.			

Particle Size Distribution AS1289 3.6.1			Consistency Limits and Moisture Content			
Sieve Size	% Passing	Specification	Test	Method	Result	Spec.
150 mm	100		Liquid Limit	% AS1289 3.1.2	114	
75 mm	100		Plastic Limit	% AS1289 3.2.1	24	
53 mm	100		Plasticity Index	% AS1289 3.3.1	90	
37.5 mm	100		Linear Shrinkage	% AS1289 3.4.1	19.0	
26.5 mm	100		Moisture Content	% AS1289 2.1.1	43.8	
19.0 mm	100		Sample History:			Oven Dried
13.2 mm	100		Preparation Method:			Dry sieved
9.5 mm	100		Crumpling / Curling of linear shrinkage:			Cracking & Curling
6.7 mm	100		Linear shrinkage mould length:			250 mm
4.75 mm	100		ND = not determined NO = not obtainable NP = non plastic			
2.36 mm	100		Moisture / Dry Density Relationship			AS 1289 5.2.1
1.18 mm	100		Maximum Dry Density:			t/m ³
600 um	100		Optimum Moisture Content:			%
425 um	99		Notes Sampled by J. Menzies 16/11/2016			
300 um	98					
150 um	96					
75 um	95					



Date: 30/11/2016



NATA Accredited Laboratory No. 15055
 Accredited for compliance with ISO/IEC 17025
 The results of the tests, calibrations and/or
 measurements in this document are traceable to
 Australian/National Standards

Chris Senserrick
 Approved Signatory



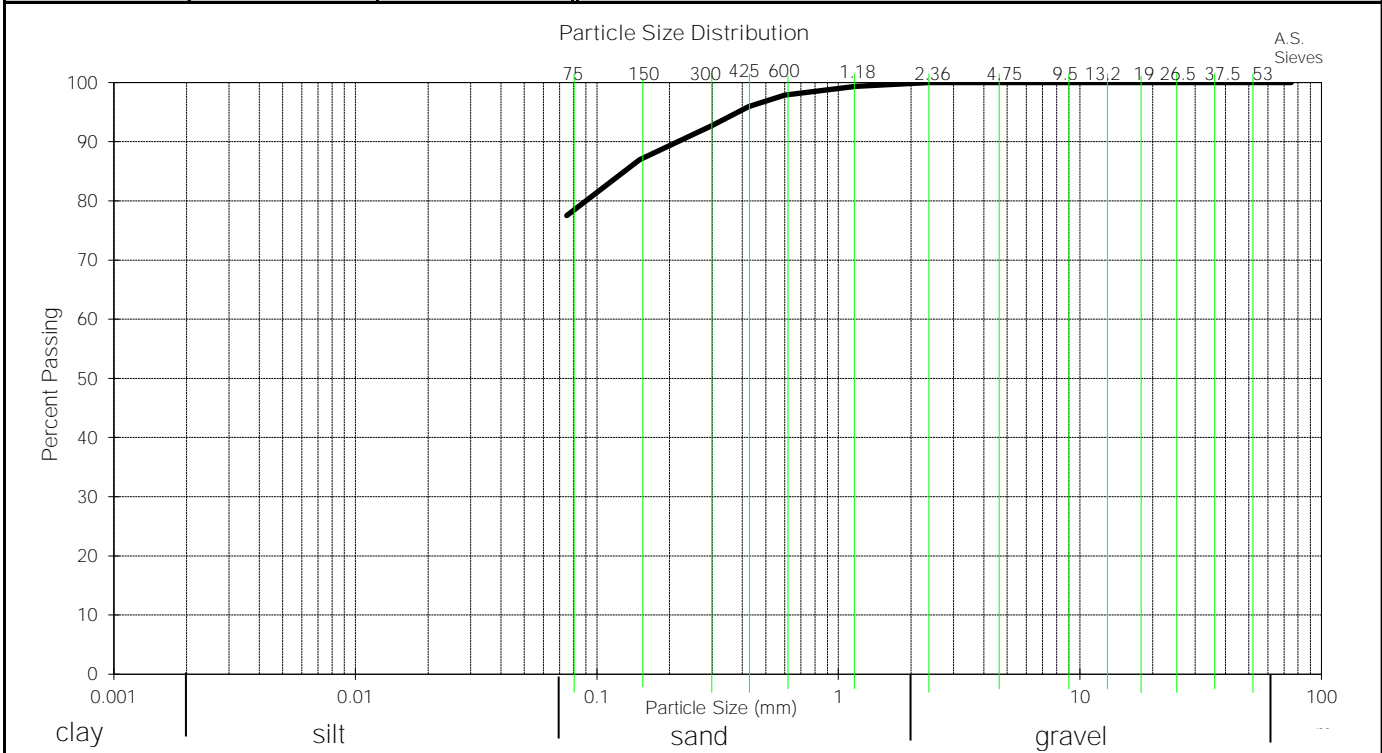
Particle Size Distribution & Atterberg Limits Test Report

A C N 105 704 078

13 Brock Street, Thomastown, VIC P 03 9464 4617 F 03 9464 4618

Client: IB REZONING C/- WILCON PROJECTS	Job No. G3154
Project: NORTHERN INVESTIGATION AREA	Test Date: 23-Nov-16
Location: LOVELY BANKS	Report No. AC
Lab Reference No. #13	Sample Identification: BH12 @ 0.4 - 0.8m
Laboratory Specimen Classification: CLAY, low plasticity, dark brown, with sand.	

Particle Size Distribution AS1289 3.6.1			Consistency Limits and Moisture Content			
Sieve Size	% Passing	Specification	Test	Method	Result	Spec.
150 mm	100		Liquid Limit	% AS1289 3.1.2	30	
75 mm	100		Plastic Limit	% AS1289 3.2.1	14	
53mm	100		Plasticity Index	% AS1289 3.3.1	16	
37.5 mm	100		Linear Shrinkage	% AS1289 3.4.1	5.5	
26.5 mm	100		Moisture Content	% AS1289 2.1.1	19.4	
19.0 mm	100		Sample History: Oven Dried			
13.2 mm	100		Preparation Method: Dry sieved			
9.5 mm	100		Crumbling / Curling of linear shrinkage: Cracking & Curling			
6.7 mm	100		Linear shrinkage mould length: 250 mm			
4.75 mm	100		ND = not determined NO = not obtainable NP = non plastic			
2.36 mm	100		Moisture / Dry Density Relationship AS 1289 5.2.1			
1.18 mm	99		Maximum Dry Density: t/m ³			
600 um	98		Optimum Moisture Content: %			
425 um	96		Notes Sampled by J. Menzies 16/11/2016			
300 um	93					
150 um	87					
75 um	78					



Date: 30/11/2016



NATA Accredited Laboratory No. 15055
 Accredited for compliance with ISO/IEC 17025
 The results of the tests, calibrations and/or
 measurements in this document are traceable to
 Australian/National Standards

Chris Senserrick
 Approved Signatory *[Signature]*



APPENDIX G – LABORATORY CHEMICAL RESULTS

CERTIFICATE OF ANALYSIS

Work Order : **EM1613971**
Client : **GROUND SCIENCE PTY LTD**
Contact : JORDAN FRASER
Address : 13 BROCK STREET
 THOMASTOWN VICTORIA, AUSTRALIA 3074
Telephone : +61 03 9464 4617
Project : G3154
Order number : Env 256
C-O-C number : ----
Sampler : JF
Site : NOTHERN INVESTIGATION AREA - LOVELY BANKS
Quote number : ----
No. of samples received : 4
No. of samples analysed : 3

Page : 1 of 8
Laboratory : Environmental Division Melbourne
Contact : Shirley LeCornu
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61-3-8549 9600
Date Samples Received : 21-Nov-2016 14:45
Date Analysis Commenced : 22-Nov-2016
Issue Date : 28-Nov-2016 12:37



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	Senior Semivolatile Instrument Chemist	Melbourne Organics, Springvale, VIC



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

∅ = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR.

Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	G3154/151116/BH2/2	G3154/151116/BH16/1	G3154/151116/BH28/1	----	----
Client sampling date / time				[15-Nov-2016]	[15-Nov-2016]	[15-Nov-2016]	----	----	
Compound	CAS Number	LOR	Unit	EM1613971-002	EM1613971-003	EM1613971-004	-----	-----	
				Result	Result	Result	----	----	
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%	13.6	20.2	14.4	----	----	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	8	<5	----	----	
Barium	7440-39-3	10	mg/kg	110	100	30	----	----	
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	----	----	
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	----	
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----	
Chromium	7440-47-3	2	mg/kg	60	75	58	----	----	
Cobalt	7440-48-4	2	mg/kg	17	25	22	----	----	
Copper	7440-50-8	5	mg/kg	14	21	15	----	----	
Lead	7439-92-1	5	mg/kg	7	8	13	----	----	
Manganese	7439-96-5	5	mg/kg	216	729	443	----	----	
Nickel	7440-02-0	2	mg/kg	40	50	35	----	----	
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	----	----	
Vanadium	7440-62-2	5	mg/kg	53	95	78	----	----	
Zinc	7440-66-6	5	mg/kg	18	31	24	----	----	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----	
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	----	----	----	----	
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser									
Weak Acid Dissociable Cyanide	----	1	mg/kg	<1	----	----	----	----	
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	----	----	----	
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	----	----	
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	----	----	
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	----	----	
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	----	----	
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	----	----	
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	----	----	
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	----	----	
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	----	----	
^ Total Chlordane (sum)	----	0.05	mg/kg	----	----	<0.05	----	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	G3154/151116/BH2/2	G3154/151116/BH16/1	G3154/151116/BH28/1	----	----
Client sampling date / time					[15-Nov-2016]	[15-Nov-2016]	[15-Nov-2016]	----	----
Compound	CAS Number	LOR	Unit		EM1613971-002	EM1613971-003	EM1613971-004	-----	-----
					Result	Result	Result	----	----
EP068A: Organochlorine Pesticides (OC) - Continued									
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	<0.05	----	----
4,4'-DDE	72-55-9	0.05	mg/kg		<0.05	----	<0.05	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	<0.05	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	<0.05	----	----
4,4'-DDD	72-54-8	0.05	mg/kg		<0.05	----	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	<0.05	----	----
4,4'-DDT	50-29-3	0.2	mg/kg		<0.2	----	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	<0.2	----	----
Mirex	2385-85-5	0.2	mg/kg		<0.20	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	<0.05	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	<0.05	----	----
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.05	mg/kg		<0.05	----	<0.05	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg		<0.05	----	<0.05	----	----
Monocrotophos	6923-22-4	0.2	mg/kg		<0.2	----	<0.2	----	----
Dimethoate	60-51-5	0.05	mg/kg		<0.05	----	<0.05	----	----
Diazinon	333-41-5	0.05	mg/kg		<0.05	----	<0.05	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg		<0.05	----	<0.05	----	----
Parathion-methyl	298-00-0	0.2	mg/kg		<0.2	----	<0.2	----	----
Malathion	121-75-5	0.05	mg/kg		<0.05	----	<0.05	----	----
Fenthion	55-38-9	0.05	mg/kg		<0.05	----	<0.05	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg		<0.05	----	<0.05	----	----
Parathion	56-38-2	0.2	mg/kg		<0.2	----	<0.2	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg		<0.05	----	<0.05	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg		<0.05	----	<0.05	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg		<0.05	----	<0.05	----	----
Fenamiphos	22224-92-6	0.05	mg/kg		<0.05	----	<0.05	----	----
Prothiofos	34643-46-4	0.05	mg/kg		<0.05	----	<0.05	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	G3154/151116/BH2/2	G3154/151116/BH16/1	G3154/151116/BH28/1	----	----
Client sampling date / time				[15-Nov-2016]	[15-Nov-2016]	[15-Nov-2016]	----	----	
Compound	CAS Number	LOR	Unit	EM1613971-002	EM1613971-003	EM1613971-004	-----	-----	
				Result	Result	Result	----	----	
EP068B: Organophosphorus Pesticides (OP) - Continued									
Ethion	563-12-2	0.05	mg/kg	<0.05	----	<0.05	----	----	
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	<0.05	----	----	
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	<0.05	----	----	
EP068C: Triazines									
Atrazine	1912-24-9	0.05	mg/kg	<0.05	----	----	----	----	
EP068D: Pyrethroids									
Bifenthrin	82657-04-3	0.05	mg/kg	<0.05	----	----	----	----	
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg	<0.5	----	----	----	----	
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	----	----	----	----	
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	----	----	----	----	
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	----	----	----	----	
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	----	----	----	----	
2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	----	----	----	----	
2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	----	----	----	----	
2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	----	----	----	----	
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	----	----	----	----	
2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	----	----	----	----	
2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	----	----	----	----	
Pentachlorophenol	87-86-5	2	mg/kg	<2	----	----	----	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----	
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----	
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----	
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----	
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----	
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	G3154/151116/BH2/2	G3154/151116/BH16/1	G3154/151116/BH28/1	----	----
Client sampling date / time				[15-Nov-2016]	[15-Nov-2016]	[15-Nov-2016]	----	----	
Compound	CAS Number	LOR	Unit	EM1613971-002	EM1613971-003	EM1613971-004	-----	-----	
				Result	Result	Result	----	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	----	----	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	----	----	----	
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	----	----	----	----	
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	----	----	----	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----	
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----	
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----	
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----	
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----	
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----	
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	----	----	----	
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----	
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----	
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----	
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----	
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	----	----	----	----	
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	94.2	----	----	----	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID		G3154/151116/BH2/2	G3154/151116/BH16/1	G3154/151116/BH28/1	----	----
Client sampling date / time		[15-Nov-2016]		[15-Nov-2016]	[15-Nov-2016]	[15-Nov-2016]	----	----
Compound	CAS Number	LOR	Unit	EM1613971-002	EM1613971-003	EM1613971-004	-----	-----
				Result	Result	Result	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	95.3	----	90.8	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	87.1	----	84.6	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	85.7	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	78.3	----	----	----	----
2,4,6-Tribromophenol	118-79-6	0.5	%	67.1	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	99.4	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	127	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	123	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.2	%	84.5	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	80.5	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	96.6	----	----	----	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	36	140
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	38	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	33	139
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2,4,6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

QUALITY CONTROL REPORT

Work Order	: EM1613971	Page	: 1 of 13
Client	: GROUND SCIENCE PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: JORDAN FRASER	Contact	: Shirley LeCornu
Address	: 13 BROCK STREET THOMASTOWN VICTORIA, AUSTRALIA 3074	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 9464 4617	Telephone	: +61-3-8549 9600
Project	: G3154	Date Samples Received	: 21-Nov-2016
Order number	: Env 256	Date Analysis Commenced	: 22-Nov-2016
C-O-C number	: ----	Issue Date	: 28-Nov-2016
Sampler	: JF		
Site	: NOTHERN INVESTIGATION AREA - LOVELY BANKS		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 3		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
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General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (QC Lot: 662867)									
EM1613969-006	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	35.6	35.7	0.00	0% - 20%
EM1613971-003	G3154/151116/BH16/1	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	20.2	19.6	3.33	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 663351)									
EM1613960-025	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	60	70	16.9	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	21	23	10.7	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	6	7	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	12	13	11.8	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	12	13	8.94	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	8	8	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	190	211	10.5	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	28	30	7.39	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	17	18	8.77	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1613969-007	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	2	2	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	40	40	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	47	46	2.20	0% - 20%
		EG005T: Cobalt	7440-48-4	2	mg/kg	15	17	9.87	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	38	41	8.53	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	21	20	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	17	18	6.58	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 663351) - continued									
EM1613969-007	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	15	15	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	101	107	5.81	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	54	54	0.00	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	60	74	20.5	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 663352)									
EM1613960-025	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1613969-007	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG048: Hexavalent Chromium (Alkaline Digest) (QC Lot: 663393)									
EM1613959-005	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1613973-006	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser (QC Lot: 664963)									
EM1613924-001	Anonymous	EK028SF: Weak Acid Dissociable Cyanide	----	1	mg/kg	<1	<1	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 663311)									
EM1613924-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 663308)									
EM1613886-002	Anonymous	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Mirex	2385-85-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068A: Organochlorine Pesticides (OC) (QC Lot: 663308) - continued									
EM1613924-001	Anonymous	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4'-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4'-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Mirex	2385-85-5	0.05	mg/kg	<0.20	<0.20	0.00	No Limit
EP068: 4.4'-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit		
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit		
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 663308)									
EM1613886-002	Anonymous	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 663308) - continued									
EM1613886-002	Anonymous	EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EM1613924-001	Anonymous	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.00	No Limit		
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit		
EP068C: Triazines (QC Lot: 663308)									
EM1613886-002	Anonymous	EP068: Atrazine	1912-24-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
EM1613924-001	Anonymous	EP068: Atrazine	1912-24-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
EP068D: Pyrethroids (QC Lot: 663308)									
EM1613886-002	Anonymous	EP068: Bifenthrin	82657-04-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
EM1613924-001	Anonymous	EP068: Bifenthrin	82657-04-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 663310)									
EM1613886-002	Anonymous	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.00	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.00	No Limit
		EM1613924-001	Anonymous	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5
EP075(SIM): 2-Chlorophenol	95-57-8			0.5	mg/kg	<0.5	<0.5	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)A: Phenolic Compounds (QC Lot: 663310) - continued									
EM1613924-001	Anonymous	EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.00	No Limit
EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.00	No Limit		
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 663310)									
EM1613886-002	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1613924-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 663310) - continued										
EM1613924-001	Anonymous	EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit	
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit	
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit	
		EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit	
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit	
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 662842)										
EM1613819-002	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit	
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 663309)										
EM1613886-002	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit	
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit	
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit	
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit	
EM1613924-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit	
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit	
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit	
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 662842)										
EM1613819-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 663309)										
EM1613886-002	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit	
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit	
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit	
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit	
EM1613924-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	120	<100	15.6	No Limit	
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit	
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit	
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	120	<50	82.4	No Limit	
EP080: BTEXN (QC Lot: 662842)										
EM1613819-002	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit	
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit	
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit	
			106-42-3							
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit	
	91-20-3	1	mg/kg	<1	<1	0.00	No Limit			



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EG005T: Total Metals by ICP-AES (QCLot: 663351)									
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	93.4	79	113	
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	100	87	114	
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	106	77	125	
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	87.7	84	124	
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	92.9	85	109	
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	94.3	89	113	
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	98.4	81	117	
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	93.4	84	116	
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	89.9	85	107	
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	95.6	87	113	
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	96.4	89	111	
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	97.5	93	109	
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	95.0	81	117	
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	92.8	89	111	
EG035T: Total Recoverable Mercury by FIMS (QCLot: 663352)									
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	98.4	85	103	
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 663393)									
EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	40 mg/kg	94.6	80	120	
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser (QCLot: 664963)									
EK028SF: Weak Acid Dissociable Cyanide	----	1	mg/kg	<1	20 mg/kg	98.4	89	113	
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 663311)									
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	91.2	55	135	
EP068A: Organochlorine Pesticides (OC) (QCLot: 663308)									
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	93.6	45	131	
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	94.1	45	125	
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	94.2	46	134	
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	94.7	49	133	
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	80.7	52	128	
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	88.6	48	128	
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	87.0	52	128	
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	97.1	52	130	
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	102	51	131	
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.6	57	135	
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	111	51	131	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report				
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EP068A: Organochlorine Pesticides (OC) (QCLot: 663308) - continued									
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	107	51	131	
EP068: 4.4'-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	94.7	51	131	
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	102	41	131	
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	87.2	52	132	
EP068: 4.4'-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	100	50	134	
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	102	49	130	
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	101	50	132	
EP068: 4.4'-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	103	38	140	
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	101	64	132	
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	107	41	141	
EP068: Mirex	2385-85-5	0.05	mg/kg	<0.05	0.5 mg/kg	102	63	138	
EP068B: Organophosphorus Pesticides (OP) (QCLot: 663308)									
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	100	54	135	
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	111	51	143	
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	33.6	10	136	
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	82.1	43	128	
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	98.4	53	131	
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	93.0	53	131	
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	89.5	51	133	
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	101	51	130	
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	95.0	54	130	
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	80.8	51	135	
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	108	49	133	
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	97.4	50	134	
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	94.6	53	131	
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	79.9	46	134	
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	95.0	51	133	
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	90.6	51	133	
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	93.1	51	133	
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	44.8	14	124	
EP068C: Triazines (QCLot: 663308)									
EP068: Atrazine	1912-24-9	0.05	mg/kg	<0.05	0.5 mg/kg	101	54	138	
EP068D: Pyrethroids (QCLot: 663308)									
EP068: Bifenthrin	82657-04-3	0.05	mg/kg	<0.05	0.5 mg/kg	102	66	132	
EP075(SIM)A: Phenolic Compounds (QCLot: 663310)									
EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	3 mg/kg	106	65	125	
EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	3 mg/kg	106	74	124	
EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	3 mg/kg	102	76	123	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report				
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EP075(SIM)A: Phenolic Compounds (QCLot: 663310) - continued									
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	6 mg/kg	100	70	123	
EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	3 mg/kg	92.1	56	120	
EP075(SIM): 2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	3 mg/kg	117	66	125	
EP075(SIM): 2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	3 mg/kg	108	61	120	
EP075(SIM): 2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	3 mg/kg	104	70	123	
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	3 mg/kg	94.8	57	122	
EP075(SIM): 2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	3 mg/kg	86.2	54	120	
EP075(SIM): 2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	3 mg/kg	# 120	57	119	
EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	6 mg/kg	64.3	20	112	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 663310)									
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	110	80	121	
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	112	70	130	
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	109	80	120	
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	99.2	70	124	
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	117	80	122	
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	122	80	126	
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	114	70	128	
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	119	80	125	
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	112	70	130	
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	119	80	126	
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	3 mg/kg	106	70	124	
	205-82-3								
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	119	75	125	
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	106	65	125	
EP075(SIM): Indeno(1,2,3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	96.8	65	128	
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	98.5	65	126	
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	95.1	65	127	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 662842)									
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	85.7	70	127	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 663309)									
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	751 mg/kg	97.4	65	131	
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3103 mg/kg	100	70	126	
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1482 mg/kg	105	70	122	
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 662842)									
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	82.5	68	125	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 663309)									
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1135 mg/kg	100	68	130	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 663309) - continued								
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	4080 mg/kg	97.2	72	116
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	162 mg/kg	101	38	132
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 662842)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	90.0	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	90.4	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	88.5	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	91.0	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	98.0	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	91.8	66	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%) MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 663351)							
EM1613960-026	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	99.8	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	126	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	110	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	98.5	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	96.4	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	101	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	98.5	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	120	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	94.2	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	105	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	101	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	104	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 663352)							
EM1613960-026	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	85.1	76	116
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 663393)							
EM1613960-009	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	40 mg/kg	97.0	58	114
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser (QCLot: 664963)							
EM1613924-019	Anonymous	EK028SF: Weak Acid Dissociable Cyanide	----	20 mg/kg	90.2	70	130



Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 663311)							
EM1613924-019	Anonymous	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	83.2	44	144
EP068A: Organochlorine Pesticides (OC) (QCLot: 663308)							
EM1613886-008	Anonymous	EP068: gamma-BHC	58-89-9	0.5 mg/kg	81.5	22	139
		EP068: Heptachlor	76-44-8	0.5 mg/kg	93.0	18	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	98.6	23	136
		EP068: Dieldrin	60-57-1	0.5 mg/kg	96.6	42	136
		EP068: Endrin	72-20-8	0.5 mg/kg	91.1	23	146
		EP068: 4,4'-DDT	50-29-3	0.5 mg/kg	83.4	20	133
EP068B: Organophosphorus Pesticides (OP) (QCLot: 663308)							
EM1613886-008	Anonymous	EP068: Diazinon	333-41-5	0.5 mg/kg	95.6	49	135
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	93.3	41	127
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	93.1	47	133
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	90.0	45	133
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	69.0	40	128
EP075(SIM)A: Phenolic Compounds (QCLot: 663310)							
EM1613886-032	Anonymous	EP075(SIM): Phenol	108-95-2	3 mg/kg	105	63	117
		EP075(SIM): 2-Chlorophenol	95-57-8	3 mg/kg	102	65	123
		EP075(SIM): 2-Nitrophenol	88-75-5	3 mg/kg	93.0	40	134
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	3 mg/kg	74.2	56	122
		EP075(SIM): Pentachlorophenol	87-86-5	3 mg/kg	52.3	15	139
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 663310)							
EM1613886-032	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	112	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	123	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 662842)							
EM1613819-005	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	81.4	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 663309)							
EM1613886-023	Anonymous	EP071: C10 - C14 Fraction	----	751 mg/kg	99.8	53	123
		EP071: C15 - C28 Fraction	----	3103 mg/kg	102	70	124
		EP071: C29 - C36 Fraction	----	1482 mg/kg	106	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 662842)							
EM1613819-005	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	77.5	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 663309)							
EM1613886-023	Anonymous	EP071: >C10 - C16 Fraction	----	1135 mg/kg	102	65	123
		EP071: >C16 - C34 Fraction	----	4080 mg/kg	98.6	67	121
		EP071: >C34 - C40 Fraction	----	162 mg/kg	99.8	44	126
EP080: BTEXN (QCLot: 662842)							

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 Work Order : EM1613971
 Client : GROUND SCIENCE PTY LTD
 Project : G3154



Sub-Matrix: **SOIL**

				<i>Matrix Spike (MS) Report</i>			
				<i>Spike</i>	<i>SpikeRecovery(%)</i>	<i>Recovery Limits (%)</i>	
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Method: Compound</i>	<i>CAS Number</i>	<i>Concentration</i>	<i>MS</i>	<i>Low</i>	<i>High</i>
EP080: BTEXN (QCLot: 662842) - continued							
EM1613819-005	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	95.0	50	136
		EP080: Toluene	108-88-3	2 mg/kg	98.1	56	139

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1613971	Page	: 1 of 7
Client	: GROUND SCIENCE PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: JORDAN FRASER	Telephone	: +61-3-8549 9600
Project	: G3154	Date Samples Received	: 21-Nov-2016
Site	: NOTHERN INVESTIGATION AREA - LOVELY BANKS	Issue Date	: 28-Nov-2016
Sampler	: JF	No. of samples received	: 4
Order number	: Env 256	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Matrix Spike outliers occur.
- Laboratory Control outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EP075(SIM)A: Phenolic Compounds	QC-663310-001	----	2.4.5-Trichlorophenol	95-95-4	120 %	57-119%	Recovery greater than upper control limit

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA055: Moisture Content								
Soil Glass Jar - Unpreserved (EA055-103) G3154/151116/BH2/2, G3154/151116/BH28/1	G3154/151116/BH16/1,	15-Nov-2016	----	----	----	22-Nov-2016	29-Nov-2016	✔
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T) G3154/151116/BH2/2, G3154/151116/BH28/1	G3154/151116/BH16/1,	15-Nov-2016	22-Nov-2016	14-May-2017	✔	23-Nov-2016	14-May-2017	✔
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T) G3154/151116/BH2/2, G3154/151116/BH28/1	G3154/151116/BH16/1,	15-Nov-2016	22-Nov-2016	13-Dec-2016	✔	23-Nov-2016	13-Dec-2016	✔
EG048: Hexavalent Chromium (Alkaline Digest)								
Soil Glass Jar - Unpreserved (EG048G) G3154/151116/BH2/2		15-Nov-2016	23-Nov-2016	13-Dec-2016	✔	23-Nov-2016	30-Nov-2016	✔
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser								
Soil Glass Jar - Unpreserved (EK028SF) G3154/151116/BH2/2		15-Nov-2016	23-Nov-2016	29-Nov-2016	✔	24-Nov-2016	07-Dec-2016	✔
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066) G3154/151116/BH2/2		15-Nov-2016	23-Nov-2016	29-Nov-2016	✔	23-Nov-2016	02-Jan-2017	✔
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068) G3154/151116/BH2/2,	G3154/151116/BH28/1	15-Nov-2016	23-Nov-2016	29-Nov-2016	✔	23-Nov-2016	02-Jan-2017	✔



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP068B: Organophosphorus Pesticides (OP)								
Soil Glass Jar - Unpreserved (EP068) G3154/151116/BH2/2,	G3154/151116/BH28/1	15-Nov-2016	23-Nov-2016	29-Nov-2016	✓	23-Nov-2016	02-Jan-2017	✓
EP068C: Triazines								
Soil Glass Jar - Unpreserved (EP068) G3154/151116/BH2/2		15-Nov-2016	23-Nov-2016	29-Nov-2016	✓	23-Nov-2016	02-Jan-2017	✓
EP068D: Pyrethroids								
Soil Glass Jar - Unpreserved (EP068) G3154/151116/BH2/2		15-Nov-2016	23-Nov-2016	29-Nov-2016	✓	23-Nov-2016	02-Jan-2017	✓
EP075(SIM)A: Phenolic Compounds								
Soil Glass Jar - Unpreserved (EP075(SIM)) G3154/151116/BH2/2		15-Nov-2016	23-Nov-2016	29-Nov-2016	✓	23-Nov-2016	02-Jan-2017	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) G3154/151116/BH2/2		15-Nov-2016	23-Nov-2016	29-Nov-2016	✓	23-Nov-2016	02-Jan-2017	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080) G3154/151116/BH2/2		15-Nov-2016	22-Nov-2016	29-Nov-2016	✓	25-Nov-2016	29-Nov-2016	✓
Soil Glass Jar - Unpreserved (EP071) G3154/151116/BH2/2		15-Nov-2016	23-Nov-2016	29-Nov-2016	✓	23-Nov-2016	02-Jan-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080) G3154/151116/BH2/2		15-Nov-2016	22-Nov-2016	29-Nov-2016	✓	25-Nov-2016	29-Nov-2016	✓
Soil Glass Jar - Unpreserved (EP071) G3154/151116/BH2/2		15-Nov-2016	23-Nov-2016	29-Nov-2016	✓	23-Nov-2016	02-Jan-2017	✓
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080) G3154/151116/BH2/2		15-Nov-2016	22-Nov-2016	29-Nov-2016	✓	25-Nov-2016	29-Nov-2016	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaural	Actual	Expected	Evaluation	
Analytical Methods							
Laboratory Duplicates (DUP)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055-103	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
WAD Cyanide by Segmented Flow Analyser	EK028SF	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
WAD Cyanide by Segmented Flow Analyser	EK028SF	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
WAD Cyanide by Segmented Flow Analyser	EK028SF	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **SOIL** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Regular	Actual	Expected	Evaluation	
<i>Analytical Methods</i>							
Matrix Spikes (MS) - Continued							
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	7	14.29	5.00	✔	NEPM 2013 B3 & ALS QC Standard
WAD Cyanide by Segmented Flow Analyser	EK028SF	1	5	20.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	SOIL	In house: Referenced to USEPA SW846, Method 3060A. Hexavalent chromium is extracted by alkaline digestion. The digest is determined by photometrically by automatic discrete analyser, following pH adjustment. The instrument uses colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
WAD Cyanide by Segmented Flow Analyser	EK028SF	SOIL	In house: Referenced to APHA 4500-CN-O. Caustic leachates of soil samples are introduced into an automated segmented flow analyser. Hydrogen cyanide is liberated from a slightly acidified (pH 4.5) and is dialysed. Tight cyanide complexes that would not be amenable to oxidation by chlorine are not converted. Iron cyanide complexes are precipitated with zinc acetate. Liberated HCN diffuses through a membrane into a stream of sodium hydroxide where it is carried as CN- The cyanide in caustic solution is buffered to pH 5.2 and further converted to cyanogen chloride by reaction with chloramine-T. Cyanogen chloride subsequently reacts with 4 μ pyridine carboxylic and 1,3 - dimethylbarbituric acids to give a red colour complex. This colour is measured at 600 nm. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatle Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.



<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
NaOH leach for CN in Soils	CN-PR	SOIL	In house: APHA 4500 CN. Samples are extracted by end-over-end tumbling with NaOH.
Alkaline digestion for Hexavalent Chromium	EG048PR	SOIL	In house: Referenced to USEPA SW846, Method 3060A.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na ₂ SO ₄ and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.