Phase 1 Soil Contamination and Sodicity Assessment

1170Z Mickleham Road, Greenvale

Client

Satterley Property Group

Issued

20/06/2022

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Surveying
Asset Recording
Civil Engineering
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Traffic & Transport Engineering
Environmental Consulting
Water Resource Engineering
Strata Certification (NSW)
Town Planning
Urban Design
Landscape Architecture
Project Management

Revision Table

REV	DESCRIPTION	DATE	AUTHORISED
1	Phase 1 Soil Contamination and Sodicity Assessment	20/06/2022	AH
0	Phase 1 Soil Contamination and Sodicity Assessment	16/06/2022	AH

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List of Abbreviations and Units

ACM	Asbestos Containing Material	**PSH**	Phase Separated Hydrocarbons
ANZECC	Australia and New Zealand Environment and Conservation Council	**QA/QC**	Quality Assurance/Quality Control
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand	**RL**	Reduced Level
AST	Above-ground Storage Tank	**RPD**	Relative Percentage Difference
BaP	Benzo(a)pyrene	**SEPP**	State Environment Protection Policy
BTEX	Benzene, Toluene, Ethyl benzene & Xylene	**SVOC**	Semi Volatile Organic Compounds
CHC	Chlorinated hydrocarbons	**SWL**	Standing Water Level
COC	Chain of Custody	**TDS**	Total Dissolved Solids
CUTEP	Clean Up to the Extent Practicable	**TEQ**	Toxicity Equivalent Quotient
DNAPL	Dense Non-Aqueous Phase Liquid	**TPH**	Total Petroleum Hydrocarbons
DO	Dissolved Oxygen	**TRH**	Total Recoverable Hydrocarbons
EC	Electrical Conductivity	**UST**	Underground Storage Tank
EIL	Environmental Investigation Level	**VOC**	Volatile Organic Compounds
EPA	Victorian Environmental Protection Authority	**VVG**	Visualising Victoria's Groundwater
GWDB	Groundwater Data Base	**-**	On tables is no data
HIL	Health Investigation Level		
HM	Heavy Metal		
HVO	Halogenated Volatile Organics	**Units**	
LNAPL	Light Non-Aqueous Phase Liquid	**µg/kg**	micrograms per kilogram (ppb)
LOR	Limit of Reporting	**µg/L**	micrograms per litre
MAH	Monocyclic Aromatic Hydrocarbons	**µs/cm**	microseimens per centimetre
NATA	National Association of Testing Authorities	**mg/kg**	milligrams per kilogram (ppm)
ND	Non Detect	**mg/L**	milligrams per litre
NEPM	National Environmental Protection Measure	**mBGL**	Metres below ground level
NHMRC	National Health and Medical Research Council	**mTOC**	Metres below top of casing
NAPL	Non-Aqueous Phase Liquid	**mAHD**	Metres Australian Height Datum
OCP	Organochlorine Pesticides	**ppb**	parts per billion
OPP	Organophosphate Pesticides	**ppm**	parts per million
PAH	Polycyclic Aromatic Hydrocarbons	**Ha**	Hectare
PCB	Polychlorinated biphenyl		
PID	Photo-ionisation detector		

1 INTRODUCTION

At the request of Satterley Property Group, Beveridge Williams & Co P/L (Beveridge Williams) conducted an Phase 1 Soil Contamination and Sodicity Assessment of 1170Z Mickleham Road, Greenvale (referred to as "the site" in this report).

The purpose of the Phase 1 Soil Contamination and Sodicity Assessment was to assess for the potential for contamination and sodic soil at the site that may impact site development.

Beveridge Williams understands that no ground disturbing works can be undertaken at the site due to a CHMP investigation that has not yet been completed.

The Environmental Site Assessment (Phase 1) presents information on the findings from a desktop site history evaluation, a site inspection and limited sodic soil testing.

2 SITE DETAILS

Site details are presented in Table 2-1.

Table 2-1: Summary of Site Details

ITEM		SITE DETAILS
Site Address		1170Z Mickleham Road, Greenvale
Approx. Site Area (ha)		22
Zoning		Rural Conservation Zone - Schedule 3 (RCZ3)
Municipality		Hume City Council
Current Use		Vacant / public open space
Surrounding land uses	North	Grazing / cropping, residential
	East	Residential
	South	Public open space / Greenvale Reservoir
	West	Public open space / residential

3 DESKTOP REVIEW & SITE INSPECTION

The following sources of historical information were reviewed:

- Aerial photographs held by Nearmap and the Department of Environment, Land, Water and Planning
- List of issued Certificates and Statements of Environmental Audit
- EPA Priority Sites Register
- Victorian Landfill Register
- Geology plans
- Nearby PSP reports

3.1 Aerial Photographs

Aerial photographs held by the Department of Environment, Land, Water and Planning (DELWP) from 1951, 1970, 1984, and 1991 were reviewed (Table 3-1). Aerial photographs from Nearmap from 2010, 2013, 2016, 2019 and 2022 were also reviewed. No signs of gross contamination were observed in any of the reviewed aerial photographs.

Table 3-1: Aerial Photograph Review

YEAR / SOURCE	SUMMARY
1951 DELWP	The site appears to be vacant. Seven trees are observed onsite. Soil discolouration (rocky outcrop) is observed in the northeast corner of the site. A dirt road is present in the southern portion of the site. A small dam is observed approx. 50 m offsite to the south. Yuroke Creek is observed approx. 250 m west of the site. Buildings and roadways that are part of the former RANAD (Royal Australian Navy Armaments Depot) are observed approx. 500 m southeast of the site.
1970 DELWP	No significant onsite changes have occurred. A small shed has been constructed immediately offsite to the east. Cropping/mowing is observed at the site immediately to the north. Construction of Greenvale Reservoir has commenced to the south, with significant earthworks occurring at the location.
1984 DELWP	No significant onsite changes have occurred. Numerous trees have been planted in the area between the site and Greenvale Reservoir to the south.
1991 DELWP	No significant onsite changes have occurred.
2010 Nearmap	Evidence of mowing/cropping is observed onsite. An onsite road has been constructed transecting the site in an E-W direction. Residential development has commenced approx. 500 m offsite to the east.
2013 Nearmap	No significant onsite changes have occurred. Residential development has commenced approx. 850 m offsite to the southwest.
2016 Nearmap	Stormwater runoff from the east appears to have been directed onsite. Greener vegetation and plant growth is observed in the central portion of the site at the location of the diverted surface water. Residential development has commenced approx. 200 m offsite to the west.
2019 Nearmap	No significant onsite or offsite changes are observed.

2022 Nearmap	No onsite changes are observed. Residential development has commenced immediately offsite to the east.

Aerial photographs are presented in Appendix B.

3.2 List of Issued Certificates and Statements of Environmental Audit and EPA Priority Sites Register

A search of the list of issued Certificates and Statements of Environmental Audit revealed that there are 2 EPA audits within 1 km of the site.

The site is not listed on the EPA Priority Sites Register. There are no EPA priority sites listed within 1 km of the site.

3.2.1 Greenvale Lakes Estate, Somerton Road, Greenvale – Audit Areas C and D (CARMS No. 56205_5 & 56205_4)

The nearby EPA audit areas are located approx. 450 m east of the site and are within the former Royal Australian Navy Armament Depot (RANAD). The RANAD facility was used for decommissioning of munitions/explosives ordnance (EO) until approx. 1995 and continued as a storage facility for munitions until 2001 when it was closed. Ordnance disposal was carried out by burning in two areas, Audit Area C "Proof Area" and Audit Area B "Small Arms Ammunition (SAA) Burn Area" (approx. 1.7 km from site) which has been remediated.

Some elevated heavy metals were reported above the applicable ecological investigation levels, however these were not considered to be of concern. Some isolated soil remediation was conducted in Area C. No soil remediation was required in Audit Area D. It was concluded that the risk of encountering any remnant EO/EOW in Audit Area C and D are low/negligible.

The Auditor concluded that groundwater at the site is not polluted with respect to any of the beneficial uses, all of which are considered not relevant in terms of their low likelihood of use.

Certificates of Environmental Audit were provided for the assessment areas, deeming them to be suitable for development for sensitive uses. Beveridge Williams considers that there is a low to very low potential for the site to have been impacted from the nearby RANAD.

No assessments for sodic soils were conducted as part of the EPA Audit reports.

3.3 Victorian Landfill Register

The Victoria Unearthed Database[1], which includes the information from the Victorian Landfill Register, was reviewed. The search revealed no former landfills within 1 km of the site.

3.4 Geology

Review of the Department of Jobs Precincts and Regions (DJPR) GeoVic version 3[2] website indicates that site is situated on Miocene to Holocene aged Newer Volcanic Group comprising olivine tholeiite, quartz tholeiite, basanite, basaltic icelandite, hawaiite, mugearite, minor scoria and ash, fluvial sediments: tholeiitic to alkaline; includes sheet flows and valley flows and intercalated gravel, sand, clay. Furthermore, late Devonian aged Bulla Granodiorite (G276) is present offsite immediately to the northwest and south, comprising biotite-cordierite granodiorite and granite: coarse-grained; minor garnet.

A site geology plan is presented on Figure 2.

3.5 Hydrogeology

3.5.1 Protected Beneficial Uses

A Visualising Victoria's Groundwater (VVG) search was completed in May 2022 which revealed that the groundwater is expected to be present from 20 m to 50 m of the surface. VVG's database also showed the site to be underlain by groundwaters with total dissolved solids (TDS) ranging from 1,000 mg/L to 7,000 mg/L. This would conservatively classify the groundwater beneath the site as Segment A2 waters, as per The Victorian Environment Reference Standard (ERS) 2021.

[1] http://mapshare.maps.vic.gov.au/victoriaunearthed/ - (online) accessed May 2022.

[2] http://er-info.dpi.vic.gov.au/sd_weave/anonymous.html - (online) accessed May 2022.

The beneficial uses of Segment A2 groundwater are listed below:

- Water dependent ecosystems and species
- Potable water supply – acceptable
- Potable mineral water supply
- Stock watering
- Industrial and commercial use
- Water-based recreation (primary contact recreation)
- Traditional Owner cultural values
- Cultural and spiritual values
- Buildings and structures
- Geothermal properties.

Groundwater flow direction at the site is anticipated to flow towards either Yuroke Creek to the west, or towards Greenvale Reservoir to the south. Regional groundwater is expected to flow to the south along Yuroke Creek towards Port Phillip Bay, approx. 25 km offsite to the south.

3.6 Topography, Drainage and Surface Water Flow

The site has an elevation gradient from the northeast (approx. 230 mAHD) down to the west (approx. 193 mAHD) towards Yuroke Creek.

The closest surface water feature is Yuroke Creek approx. 60 m offsite to the west. Small dams are located approx. 100 m to the east, and 100 m to the south. Greenvale Reservoir is approx. 300 m offsite to the south. Surface water is expected to flow to the west/southwest towards Yuroke Creek.

The onsite elevation contours are presented on Figure 2.

3.7 Review of Nearby PSP Reports

A review of nearby PSP reports was conducted to investigate nearby sodic soil assessments. Scarce information regarding sodic soil was observed during the review.

3.7.1 Jacobs – '*Sodic Soils Assessment, Wallan South Precinct Area*' (2021)

Beveridge Williams has reviewed Jacobs' Sodic Soils Assessment for the Wallan South Precinct Area (2021) located approx. 20km to the north of site. In Australia, sodic soils are categorised as soils with an ESP of 6-14% and strongly sodic soils have an ESP of 15% or greater[3]. ESP values from surface samples were reported between 0.93-10%. ESP values of soil samples when broken down by depth were as follows:

- 0-10cm – average ESP of 4.3%. Of the 66 samples collected, 56 samples (87.5%) were deemed non-sodic while 8 samples (12.5%) were deemed sodic.
- 30-40cm – average ESP of 7.8%. Of the 64 samples collected, 36 samples were sodic (56%). A total of 30 samples (44%) including both A2/A3 horizon topsoil and B horizon clay recorded non-sodic conditions.
- 60-140cm – average of 22.1%. All samples were of high or very high sodicity from a total of 17 deeper samples.

Beveridge Williams notes that as there is a higher concentration of sodic soils observed in underlying soil horizons, the surface soil sampling conducted at the site is unlikely to provide a clear understanding sodicity of onsite soils.

3.7.2 Beveridge Williams – '*Hydrogeological, Salinity, Acid Sulphate Soil and Geotechnical Assessment, Craigieburn West PSP*' (2020)

Beveridge Williams has reviewed its 2020 report. No consideration was given to sodic soils as part of the assessment, however, saline soil was assessed. With regard to saline soil, it was considered that:

[3] https://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/sodic_soils - accessed May 2022.

- The risk to future development activities as a result of underlying hydrogeology, soil salinity, acid sulphate soils and geotechnical conditions across the majority of the PSP area is likely to be low
- The preliminary soils sampling confirmed soils confirmed the majority of the soils across the PSP area ranged between non-saline to slightly saline soils (Section 5.2.2) and the risk of dryland salinity is considered low across the PSP area
- Isolated areas of potential salinity may be present with areas of shallow groundwater through the central portion of the PSP area (inferred shallow groundwater of moderate to high salinity and in proximity to dams and other surface water bodies).

With regard to saline soil, it was recommended that:

- Further precinct designs should be carried out on the basis of soils within the precinct area ranging between non-saline to moderately saline soils (Section 5.2.2) including appropriate construction materials proposed to be in direct contact with underlying natural soils or groundwater used in any precinct development works are sufficiently rated for use in the observed site conditions and proposed use
- Prior to detailed design (drainage, subdivision or underground infrastructure alignments) a precinct wide OR development specific physical groundwater investigation through the areas identified with shallow (<5 m) and potential saline waters (TDS concentrations indicated between 7,000 - 13,000 mg/L), as shown on Figures 4 and 5 respectively, including a gauging/sampling round to confirm the groundwater flow direction and hydrogeological conditions to confirm risk of groundwater intrusion during excavation or bulk earthworks within the precinct area and the management measures required for any water intrusion which may be encountered.
- Where shallow groundwater is encountered (from further physical hydrogeological investigations detailed above) and potential for upwards intrusion into future drainage and /or retention basins is confirmed, a clay (or similar) capping barrier should be designed to minimise upward intrusion of potentially saline waters into proposed stormwater systems and retaining basins.
- Based on the moderate to high reactivity (expansion and contraction with changing moisture content) reported within BH05, BH16 and BH17 (shown on Figure 8), consideration should be made where structures are proposed to be in contact with the identified grey silty CLAY/clayey SILT

3.7.3 Acid Sulphate Soils

A review of the Victorian Resources online[4] plans indicate that the site is not identified as a potential acid sulphate soils area with the closest known area of acid sulphate soils located approximately 11 km south in Oak Park.

3.8 Site Inspection

Beveridge Williams Environmental Professionals conducted site inspections on 13 May 2022 where the following observations were made:

- Access to site was Compass Drive to the east.
- The onsite elevation high was located in the northeast corner of the site. The site elevation sloped down across the site to the west towards Yuroke Creek to the west.
- The site was covered with low-lying vegetation including grass and weeds. Some large trees were located onsite in the south/southeast portions of the site.
- Basalt floaters were observed from surface in the northeast corner of the site.
- A sandy clay fill was observed at surface within the onsite track in the southern portion of the site.
- A water asset was observed in the southeast portion of the site. Vegetation was noted to be much greener downstream of the water asset.
- An empty and disused fuel storage tank was observed in the eastern portion of the site. The tank was open on one side.

[4] http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/soil_acid_sulfate_soils_pdfs/$FILE/melbourne-t7822.pdf - accessed May 2022.

Site photographs taken during the inspection are presented in Appendix C.

3.9 Potential Contaminants of Concern

Based on the information provided by the site history and site inspection, the following activities and potential contaminants have been listed in Table 3-2.

Table 3-2: Potential Contaminants of Concern

Site Activities	Onsite / offsite	Location	Potential Contaminants
Grazing/cropping	Onsite	Whole site	Heavy metals, total recoverable hydrocarbons & total petroleum hydrocarbons (TRH/TPH), organochlorine pesticides (OCP)
Imported fill material (onsite track)	Onsite	Southern portion	Heavy metals, total recoverable hydrocarbons & total petroleum hydrocarbons (TRH/TPH), organochlorine pesticides (OCP), polycyclic aromatic hydrocarbons (PAH), halogenated volatile organics (HVO), chlorinated hydrocarbons (CHC), phenols

4 LIMITED CONTAMINATION AND SODIC SOIL ASSESSMENT

4.1 Assessment Guidelines and Criteria

The Victorian Environment Reference Standard (ERS) 2021, lists the beneficial uses for each segment of land to be protected.

Table 4-1: Environmental Values for Land Use Categories

ENVIRONMENTAL VALUES		LAND USE						
		PARKS AND RESERVES	AGRICULTURAL	SENSITIVE USE		RECREATION / OPEN SPACE	COMMERCIAL	INDUSTRIAL
				HIGH DENSITY	OTHER			
Maintenance of ecosystems	Natural Ecosystems	√						
	Modified Ecosystems	√	√		√	√		
	Highly Modified Ecosystems		√	√	√	√	√	√
Human Health		√	√	√	√	√	√	√
Buildings and Structures		√	√	√	√	√	√	√
Aesthetics		√		√	√	√	√	
Production of food, flora and fibre		√	√		√			

Note: Table 4-1 is a reproduction of 'Table 4.2: Environmental values that apply to the land use categories' (Environment Reference Standard), May 2021. The shading denotes the beneficial uses to be protected for the proposed site use.

- **Maintenance of modified and highly modified ecosystems** – National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1) (NEPM (Amendment 2013)) - Ecological Investigation Levels (EIL). EPA Fill criteria (Publication No. 1828.2 (Waste disposal categories – characteristics and thresholds) published by the Environment Protection Authority of Victoria), which lists the maximum concentrations of contaminants allowed in soil to be disposed of as Clean Fill, Category D, Category C and Category B Contaminated Soil) has been referenced as a guide also.
- **Human health** – NEPM (Amendment 2013) Human Health Investigation Levels (HIL) for sensitive uses (i.e. primary schools - HIL A) and CRC Care 2011 Direct Contact HSL A have been referenced
- **Buildings and structures** – Contamination must not cause the land to be corrosive to or adversely affect the integrity of structures or building materials
- **Aesthetics** – Contamination must not cause the land to be offensive to the senses of human beings
- **Production of food, flora and fibre** – Contamination of land must not adversely affect produce quality, flora and fibre yield or affect the level of any indicator in food, flora and fibre produced at the site (or that may be produced).

4.1.1 NEPM (Amendment 2013) Ecological Investigation Levels Criteria Derivation

The NEPM (Amendment 2013) states that '*the EIL [criteria] takes into account the biological availability of the element in different soils and separate naturally occurring concentrations of a contaminant and the added contaminant in deriving EILs which are based on the 'added risk approach*'. This approach assumes that the availability of the ambient background concentration (ABC, the soil concentration in a specified locality that is the sum of the naturally occurring background and the contaminant levels that have been introduced from diffuse or non-point sources by general anthropogenic activity not attributed to industrial, commercial, or agricultural activities) of a contaminant is zero or

sufficiently close that it makes no practical difference. More importantly, it assumes that the background '*has resulted in the biodiversity of ecosystems or serves to fulfil the needs for micronutrients for the organisms in the environment*'. Therefore, the approach views only the effect of added contaminants to the environment as adverse (for further information refer to Section 2.4, Schedule B5b). Thus, rather than having a single numerical limit for a contaminant, different soils will have different limits. The EIL derivation methodology generates, wherever possible, soil-specific EILs'.

Beveridge Williams considers that any contamination identified on the site is unlikely to have been added within the last 2 years indicating that contamination would be "aged" (as defined by NEPM (Amendment 2013)). Therefore, Beveridge Williams has adopted the most conservative "aged" values listed in Appendix A of NEPM (Amendment 2013) Schedule B5a "Guide on Ecological Risk Assessment" for commercial and industrial for reporting purposes.

4.2 Field Methodology

All fieldworks were carried out in accordance with Australian Standard (AS) 4482.1-2005 by a Beveridge Williams Environmental Professional who logged the soil samples generally in accordance with AS 1726-1993 and obtained disturbed soil samples at nominated depths.

Each sample was taken in accordance with the following procedures:

- Surface samples were collected with a gloved hand. No intrusive ground disturbance (i.e. shovel, trowel, auger) was utilised during the sample collection.
- Disposable rubber nitrile gloves worn by the Environmental Professional were replaced prior to the recovery of each sample.

The soil samples were placed into acid-rinsed and solvent-washed screw-top glass jars supplied by the analysing laboratory. The jars were tightly closed and kept on ice in a portable cooler until delivery to the laboratory under chain of custody procedures.

Each soil sample was assessed both visually and by odour for evidence of contamination with a ranking on a scale of 0 - 3 as follows:

0 No odour or visual evidence of contamination

1 Slight visual evidence of contamination and/or slight odour

2 Visual evidence of contamination and/or odour

3 Obvious visual evidence of contamination and/or strong odour.

A calibrated photoionization detector (PID) was used to screen for the presence of volatile organic compounds (VOCs) in all samples collected. During sampling, an extra sample was collected and placed in a properly sealed snap-lock plastic bag. The volume of soil used for obtaining PID readings was kept generally uniform for all samples tested. After approximately 15 minutes the plastic bag was pierced with the probe to obtain a PID reading.

All sample locations have been determined and recorded using a hand-held GPS unit (error tolerance +/- 3 m) or determined using measurements from fixed structures/features on-site.

All chemical testing was undertaken by the following NATA registered analytical laboratories:

- Primary testing laboratory - Ecowise Australia Pty Ltd (ALS Water Resources Group, ALSWRG)
- Secondary testing laboratory (for QA/QC purposes) - Eurofins Services Pty Ltd (Eurofins).

4.3 Soil Sampling Strategy and Soil Investigation (13 May 2022)

On 13 May 2022 a total of six surface soil samples (220513-SS01 to 220513-SS06) were collected by gloved hand across the site targeting areas which exhibited potential for surface erosion (i.e., high elevation gradient, increased surface water flow).

4.3.1 Soil Observations

Fill material comprising pale red sandy clay was observed within an onsite track in the southern portion of the site (E-W).

Natural soils were observed from surface across the remainder of the site. Natural soils consisted of a brown clayey silt topsoil with trace sand. Low-lying grass was observed across most of the site.

4.3.2 Sodic Soil Observations

Some common signs of sodic soils include[5]:

- Poor vegetation or crop growth
- Poor water infiltration
- Surface crusting
- Dense or hard subsoil
- prismatic or columnar structure in the subsoil
- Soapy feel when wetting and working up for soil textures
- pH > 8.5
- Cloudy water in puddles
- Shallow rooting depth.

During Beveridge Williams' site inspection, Beveridge Williams noted the following:

- Shallow rooting depth in the subsoils (noted in SS06)

4.3.3 Contamination Ranking and PID Readings

No odours or visible signs of contamination were noted in soil samples.

Table 4-2: Soil Sample Contamination Rankings

CONTAMINATION RANKING	SAMPLE ID	REASON
0	All Beveridge Williams samples	No odour or visual evidence of contamination

4.4 Sodic Soil Testing Program

The chemical testing program for individual samples is detailed in Table 4-3.

Table 4-3: Soil Sample Testing Program

SAMPLE NUMBERS	TESTING PROGRAM
SS01-SS05	Exchangeable Cations (Ca, Mg, Na, K, Al) + Cation Exchange Capacity (CEC)– pH (1:5) pH ($CaCl_2$) Electrical conductivity (EC)

4.5 Sodic Soil Testing Results

The results for sodic soil testing are presented in Table 4-4.

[5] https://www.qld.gov.au/environment/land/management/soil/soil-properties/sodicity – accessed May 2022.

Table 4-4: Soil Chemical Testing Results

ANALYTE	PH (1:5) (UNITS)	PH ($CACL_2$) (UNITS)	EC (US/CM)	CEC (MEQ/100G)	ESP[6] (%)
SS01	5.4	4.9	40	30	0.93
SS02	5.6	4.7	110	19	4.84
SS03	6.2	5	25	20	2.45
SS04	6.4	5	51	14	10.00
SS05	5.7	4.8	56	12	2.75

NATA Laboratory Certificates of Analysis for the tested soil samples are presented in Appendix E.

4.6 Soil Testing Analysis

In Australia, sodic soils are categorised as soils with an ESP of 6-14% and strongly sodic soils have an ESP of 15% or greater[7]. ESP values from surface samples from site were reported between 0.93-10%. One sample (220513-SS04, taken from the southwest corner) reported an ESP value of 10%. The remaining surface samples reported ESP values below 4.85%

As salinity levels may affect vegetation, EC ranges have been derived from plant tolerance levels for different soil types by Victoria Resources Online[8] (previously managed by the Department of Environment and Primary Industries).

Table 4-5: Water Classification of Soil Solutions

WATER CLASS.	EC 1:5 (US/CM)		
	SANDY LOAMS	CLAY LOAMS TO LIGHT CLAYS	MEDIUM TO HEAVY CLAYS
Non-saline (S0)	<200	<200	<300
Slightly saline (S1)	200-300	200-400	300-600
Moderately saline (S2)	400-700	500-900	700-1,300
Highly saline (S3)	800-1,500	1,000-1,800	1,400-2,700
Extremely saline (S4)	>1,500	>1,800	>2,700

Electrical conductivity of 1:5 soil solutions were all reported to be non-saline (S0).

[6] Calculated by Beveridge Williams (*ESP = Exchangeable {Na/CEC} x 100*) where soil pH is acidic. https://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/sodic_soils_assess - accessed June 2022.

[7] https://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/sodic_soils - accessed May 2022.

[8] http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/water_spotting_soil_salting#sc – accessed June 2022.

5 CONCLUSIONS AND RECOMMENDATIONS

Beveridge Williams has completed an Phase 1 Soil Contamination and Sodicity Assessment at the site to identify potential contamination risks from current or historical site and surrounding land uses, and to determine the potential for sodic soils at the site.

Based on a site history review and site inspection, Beveridge Williams considers the potential for widespread soil or groundwater contamination at the site to be low.

Based on the distance to the Craigieburn West PSP area (immediately north of the site), consideration has been given to the potential for saline soil at the site. Testing data from 5 surface samples have reported low salinity, therefore the risk of saline soils onsite is considered to be low. Based on the depth to groundwater (20 to 50 m of ground surface), it is considered that saline water intrusion is low.

Based on a broad-scale sodic soil assessment in the region (refer to Section 3.7.1 above), sodic soils were typically encountered within the underlying horizons (30-40cm) of soils. One of five soil samples collected from the surface of the site (0.0-0.1 m) exhibited properties of sodic soils. Therefore, based on this and combined with the broader soil conditions reported in the nearby PSP areas, Beveridge Williams considers that there is a low to moderate potential for sodic soils to be present at the site.

Based on the preliminary nature of this assessment and the potential for sodic soils to be present in underlying soils, it is recommended that further soil sampling from the top 1 m of soil at the site be conducted to assess for sodic soils in the subsurface to verify the low to moderate risk. Beveridge Williams notes that based on the low to moderate risk, these further investigation works can be done as part of a future planning permit application in relation to the proposed development, with any potential remediation (if required) to occur following issue of a planning permit.

6 LIMITATIONS

Soil and rock formations are variable. The surface sample logs indicate the approximate surface conditions only at the specific test locations. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. The precision with which subsurface conditions are indicated depends largely on the frequency and method of sampling, and the uniformity of subsurface conditions.

Chemical conditions described in this report refer only to those conditions indicated by analysis of samples obtained at the points and under the circumstances noted in the report.

These conditions may differ due to the variability of contaminant concentrations in imported fill material or in natural soil as a consequence of activities on the site or adjacent sites. Where conditions encountered at the site or the proposed development differ significantly from those anticipated in this report, it is a condition of this report that Beveridge Williams & Co Pty Ltd be notified of the changes and provided with an opportunity to review the recommendations of this report.

This report has been prepared as per the scope of works agreed between Beveridge Williams & Co Pty Ltd and the Client which commissioned the report. This report cannot be relied on by any other third party for any purpose except with our prior written consent. The Client may distribute this report to other parties and in doing so warrants that the report is suitable for the purpose it was intended for. However, any party intending to rely on this report should contact Beveridge Williams to determine the suitability of this report for their specific purpose.

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FIGURES

Approximate Site Location

Rev Description Date By App.

Project Name: Phase 1 Soil Contamination and Sodicity Assessment - 1170Z Mickleham Road, Greenvale

Drawing Title: Site Location Plan

Client: Satterley Property Group

Drawn J.TILLIG
Date 09.05.2022

Approved A.HAYES
Date 16.06.2022

Image Source NEARMAP

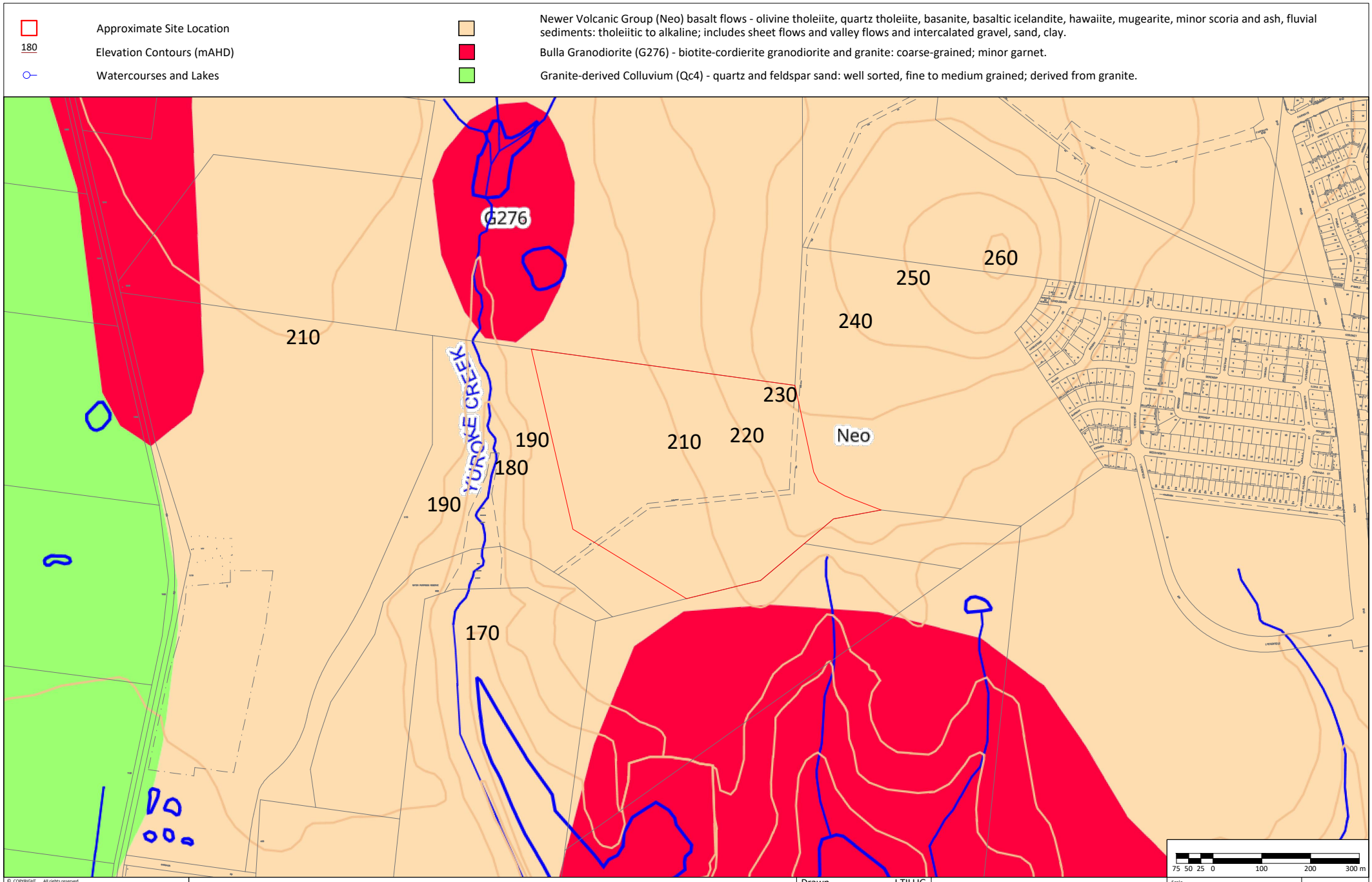
Beveridge Williams
development & environment consultants
1 Glenferrie Road
Malvern VIC 3144
Ph : 03 9524 8888
Fax: 03 9524 8899
www.beveridgewilliams.com.au

Scale
1:10,000 @ A4

Project Ref. 2200924
Figure No. 01
Rev. 0

Drawing Ref.
K:\JOBS DATA\2200924 - 1170Z MICKLEHAM RD, GREENVALE_ENV\00\PLANS\2200924 - PLAN.DWG

N



Rev Description Date By App.

Project Name: Phase 1 Soil Contamination and Sodicity Assessment - 1170Z Mickleham Road, Greenvale

Drawing Title: Regional Geology, Topography and Watercourses Plan

Client: Satterley Property Group

Drawn	J.TILLIG
Date	09.05.2022
Approved	A.HAYES
Date	16.06.2022
Image Source	NEARMAP

Beveridge Williams
development & environment consultants
1 Glenferrie Road
Malvern VIC 3144
Ph : 03 9524 8888
Fax: 03 9524 8899
www.beveridgewilliams.com.au

Scale: 1:10,000 @ A4

Project Ref. 2200924 | Figure No. 02 | Rev. 0

Drawing Ref. K:\JOBS DATA\2200924 - 1170Z MICKLEHAM RD, GREENVALE_ENV\00\PLANS\2200924 - PLAN.DWG

N

Approximate Site Location

SS01 Approximate Surface Sample Location

Rev Description Date By App.

Project Name: Phase 1 Soil Contamination and Sodicity Assessment - 1170Z Mickleham Road, Greenvale

Drawing Title: Sample Location Plan

Client: Satterley Property Group

Drawn: J.TILLIG 09.05.2022

Approved: A.HAYES 16.06.2022

Image Source: NEARMAP

Beveridge Williams
development & environment consultants
1 Glenferrie Road
Malvern VIC 3144
Ph : 03 9524 8888
Fax: 03 9524 8899
www.beveridgewilliams.com.au

Scale: 1:4,000 @ A4

Project Ref.: 2200924 Figure No.: 03 Rev.: 0

Drawing Ref.: K:\JOBS DATA\2200924 - 1170Z MICKLEHAM RD, GREENVALE_ENV\00\PLANS\2200924 - PLAN.DWG

N

APPENDIX A PLANNING PROPERTY REPORT

PLANNING PROPERTY REPORT

From www.planning.vic.gov.au at 09 May 2022 10:49 AM

PROPERTY DETAILS

Address:	**1170Z MICKLEHAM ROAD GREENVALE 3059**
Lot and Plan Number:	**Lot Z PS837871**
Standard Parcel Identifier (SPI):	**Z\PS837871**
Local Government Area (Council):	**HUME** www.hume.vic.gov.au
Council Property Number:	**743146**
Planning Scheme:	**Hume** Planning Scheme - Hume
Directory Reference:	**Melway 179 C1**

UTILITIES

Rural Water Corporation:	**Southern Rural Water**
Melbourne Water Retailer:	**Yarra Valley Water**
Melbourne Water:	**Inside drainage boundary**
Power Distributor:	**JEMENA**

STATE ELECTORATES

Legislative Council:	**NORTHERN METROPOLITAN**
Legislative Assembly:	**YUROKE**

OTHER

Registered Aboriginal Party:	**Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation**

View location in VicPlan

Note

This land is in an area added to the Urban Growth Boundary after 2005.
It may be subject to the Growth Area Infrastructure Contribution.

For more information about this project go to Victorian Planning Authority

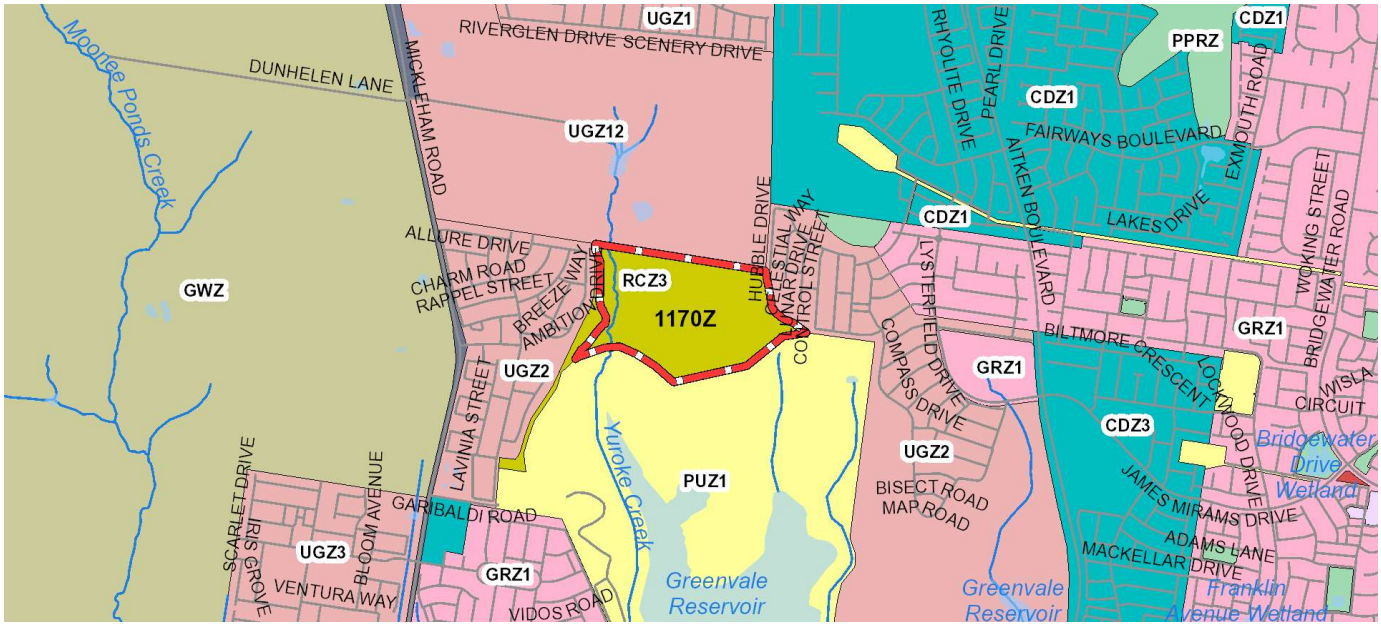
PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

Planning Zones

RURAL CONSERVATION ZONE (RCZ)

RURAL CONSERVATION ZONE - SCHEDULE 3 (RCZ3)



0 ——— 850 m

C1Z - Commercial 1	CDZ - Comprehensive Development	GRZ - General Residential
GWZ - Green Wedge	MUZ - Mixed Use	PPRZ - Public Park and Recreation
PUZ1 - Public Use-Service and Utility	PUZ2 - Public Use-Education	PUZ3 - Public Use-Health & Community
RCZ - Rural Conservation	TRZ2 - Principal Road Network	UGZ - Urban Growth
Water area	Water course	

Note: labels for zones may appear outside the actual zone - please compare the labels with the legend.

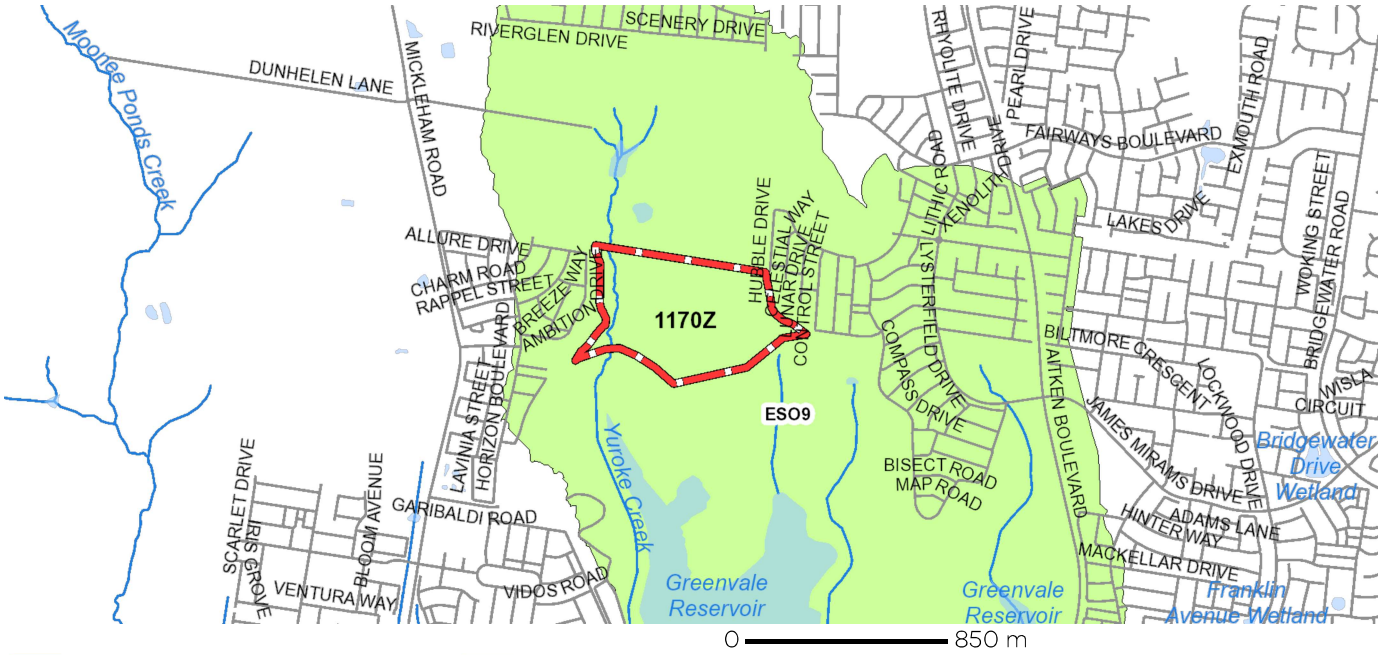
PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

Planning Overlays

ENVIRONMENTAL SIGNIFICANCE OVERLAY (ESO)

ENVIRONMENTAL SIGNIFICANCE OVERLAY – SCHEDULE 9 (ESO9)

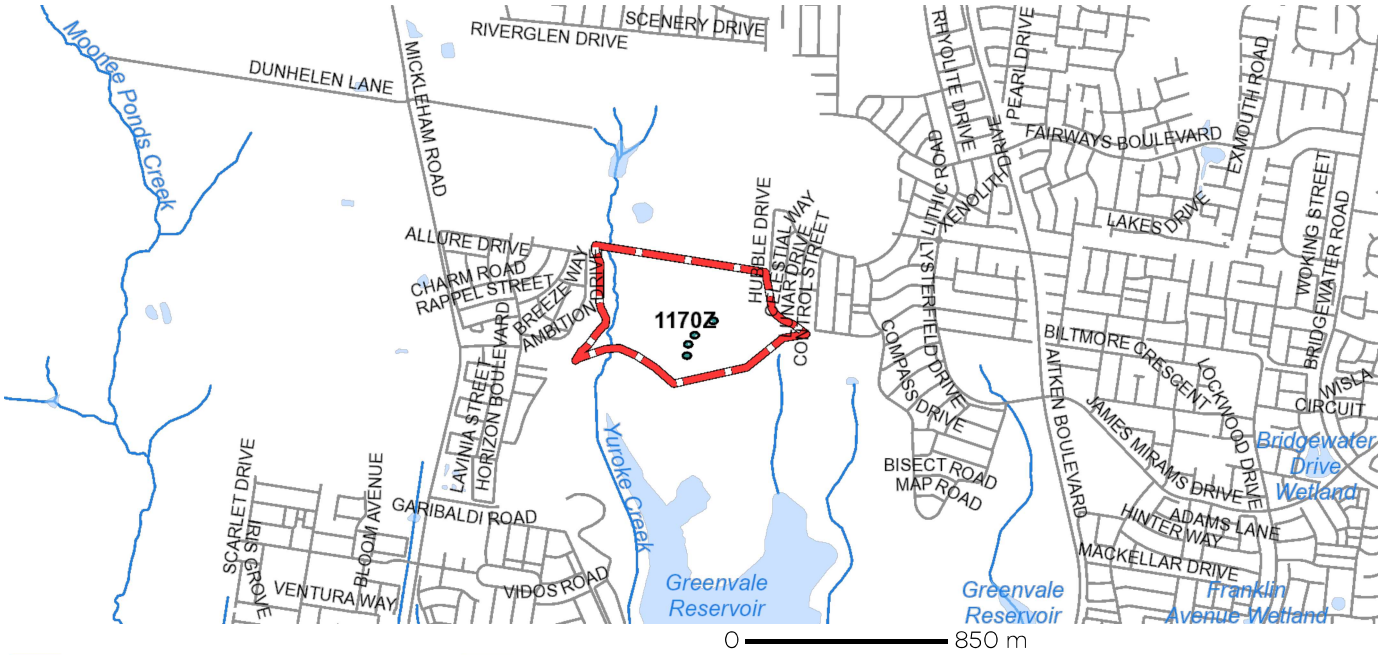


ESO - Environmental Significance | Water area | Water course

Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

VEGETATION PROTECTION OVERLAY (VPO)

VEGETATION PROTECTION OVERLAY – SCHEDULE 4 (VPO4)



VPO - Vegetation Protection | Water area | Water course

Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

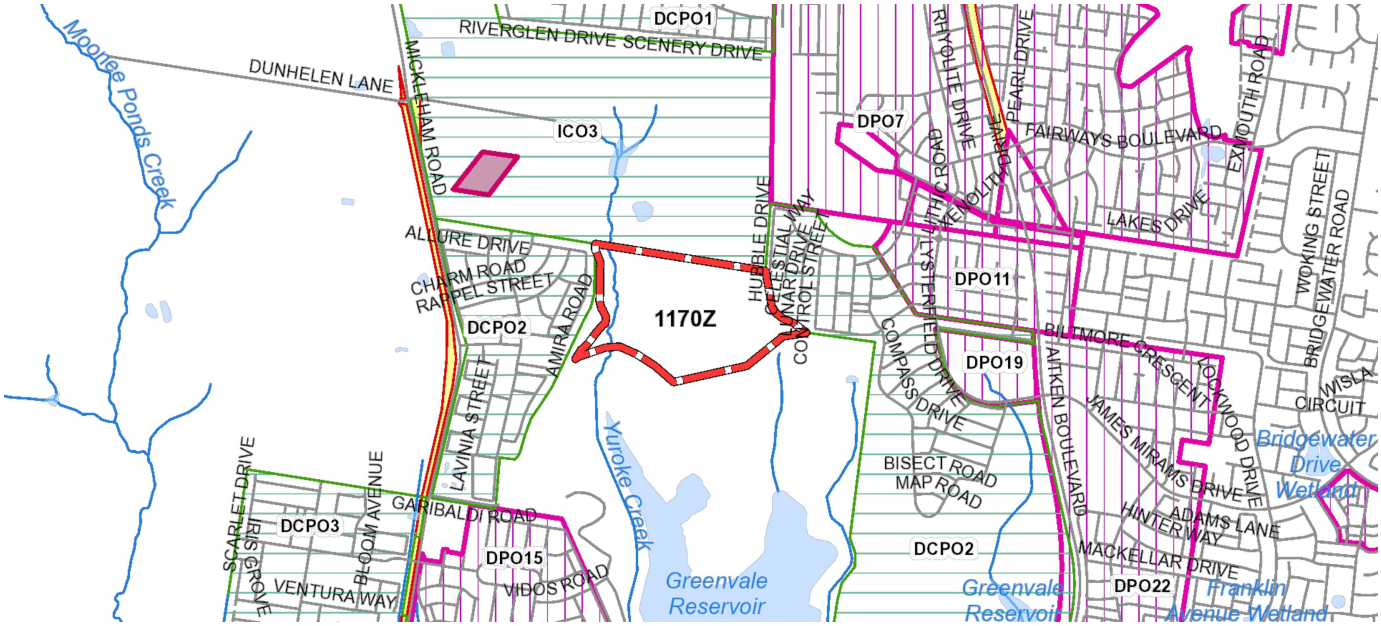
PLANNING PROPERTY REPORT

Planning Overlays

OTHER OVERLAYS

Other overlays in the vicinity not directly affecting this land

DEVELOPMENT CONTRIBUTIONS PLAN OVERLAY (DCPO)
DEVELOPMENT PLAN OVERLAY (DPO)
HERITAGE OVERLAY (HO)
INFRASTRUCTURE CONTRIBUTIONS OVERLAY (ICO)
PUBLIC ACQUISITION OVERLAY (PAO)



DCPO - Development Contributions Plan
DPO - Development Plan
HO - Heritage
ICO - Infrastructure Contributions
PAO - Public Acquisition
Water area
Water course

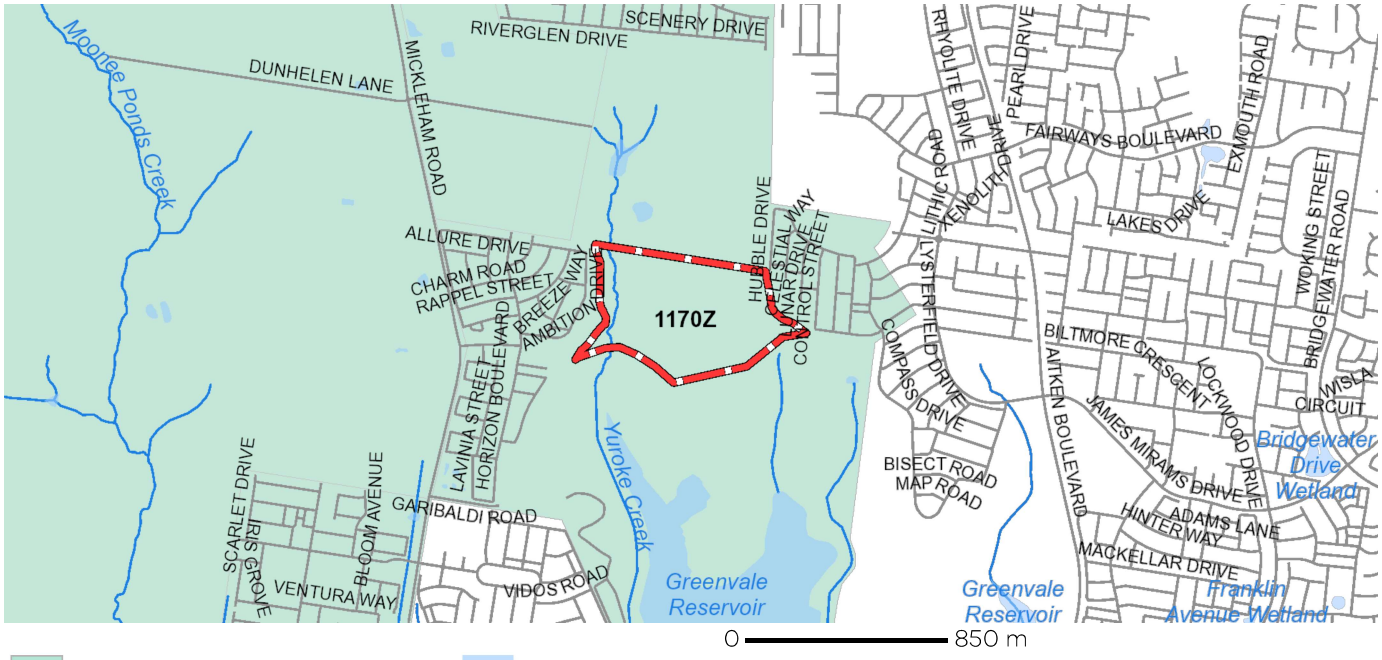
Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

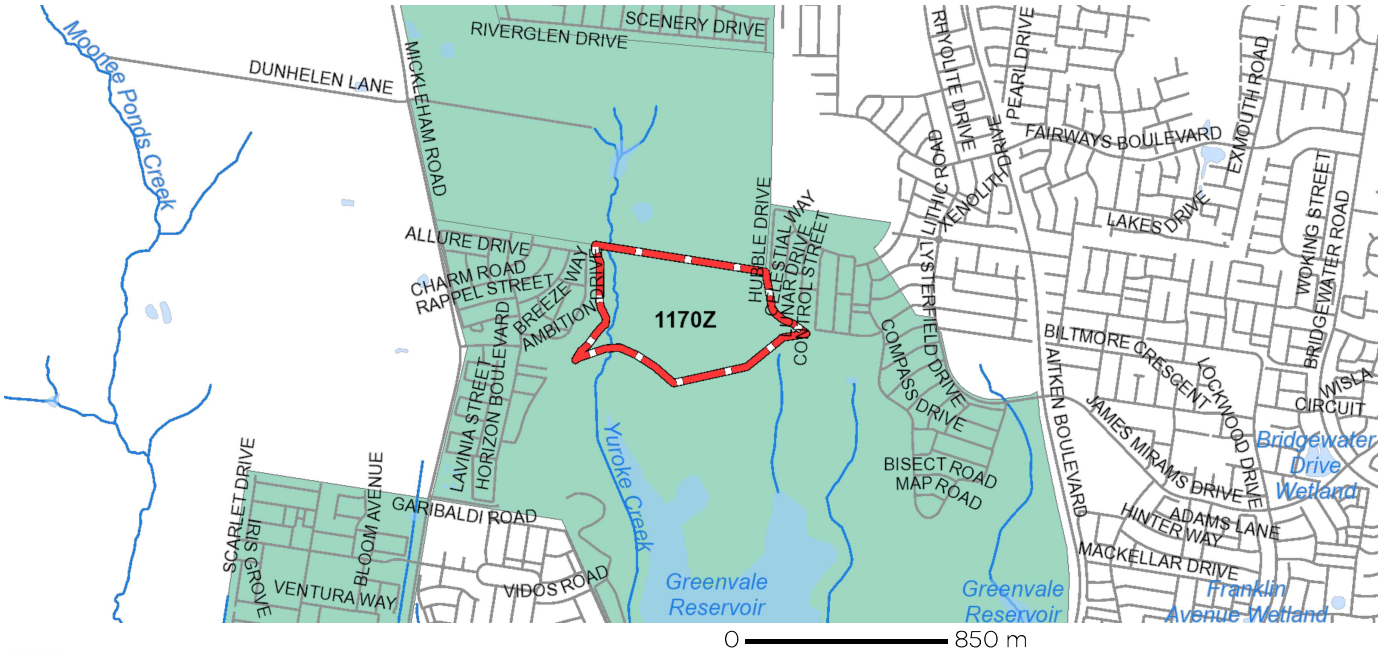
Growth Area Infrastructure Contribution

This property is in an area added to the Urban Growth Boundary after 2005.
It may be subject to the Growth Area Infrastructure Contribution.
For more information about this contribution go to Victorian Planning Authority



Melbourne Strategic Assessment

This property may be located within the Melbourne Strategic Assessment program area. Actions associated with urban development are subject to requirements of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
Follow the link for more details: https://nvim.delwp.vic.gov.au/BCS



PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

Areas of Aboriginal Cultural Heritage Sensitivity

All or part of this property is an 'area of cultural heritage sensitivity'.

'Areas of cultural heritage sensitivity' are defined under the Aboriginal Heritage Regulations 2018, and include registered Aboriginal cultural heritage places and land form types that are generally regarded as more likely to contain Aboriginal cultural heritage.

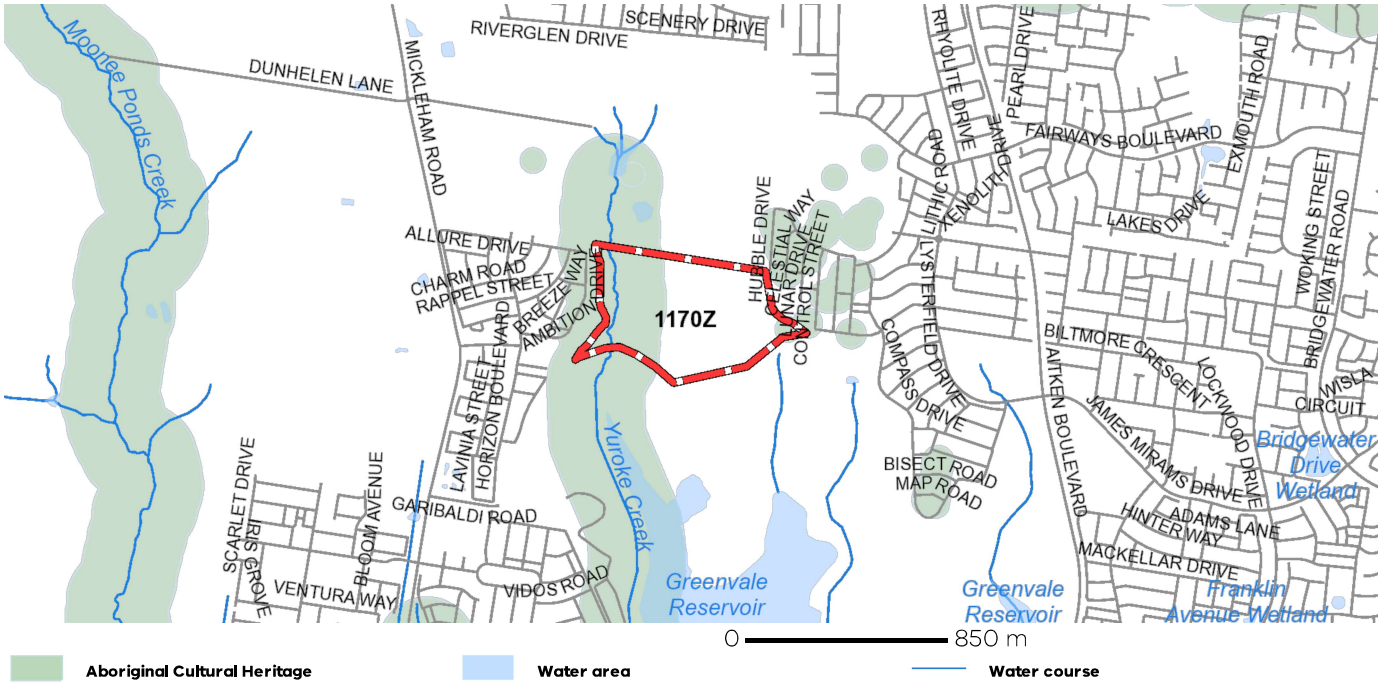
Under the Aboriginal Heritage Regulations 2018, 'areas of cultural heritage sensitivity' are one part of a two part trigger which require a 'cultural heritage management plan' be prepared where a listed 'high impact activity' is proposed.

If a significant land use change is proposed (for example, a subdivision into 3 or more lots), a cultural heritage management plan may be triggered. One or two dwellings, works ancillary to a dwelling, services to a dwelling, alteration of buildings and minor works are examples of works exempt from this requirement.

Under the Aboriginal Heritage Act 2006, where a cultural heritage management plan is required, planning permits, licences and work authorities cannot be issued unless the cultural heritage management plan has been approved for the activity.

For further information about whether a Cultural Heritage Management Plan is required go to http://www.aav.nrms.net.au/aavQuestion1.aspx

More information, including links to both the Aboriginal Heritage Act 2006 and the Aboriginal Heritage Regulations 2018, can also be found here - https://www.aboriginalvictoria.vic.gov.au/aboriginal-heritage-legislation



PLANNING PROPERTY REPORT

Further Planning Information

Planning scheme data last updated on 2 May 2022.

A **planning scheme** sets out policies and requirements for the use, development and protection of land.
This report provides information about the zone and overlay provisions that apply to the selected land.
Information about the State and local policy, particular, general and operational provisions of the local planning scheme that may affect the use of this land can be obtained by contacting the local council or by visiting https://www.planning.vic.gov.au

This report is NOT a **Planning Certificate** issued pursuant to Section 199 of the ***Planning and Environment Act 1987.***
It does not include information about exhibited planning scheme amendments, or zonings that may abut the land.
To obtain a Planning Certificate go to Titles and Property Certificates at Landata - https://www.landata.vic.gov.au

For details of surrounding properties, use this service to get the Reports for properties of interest.

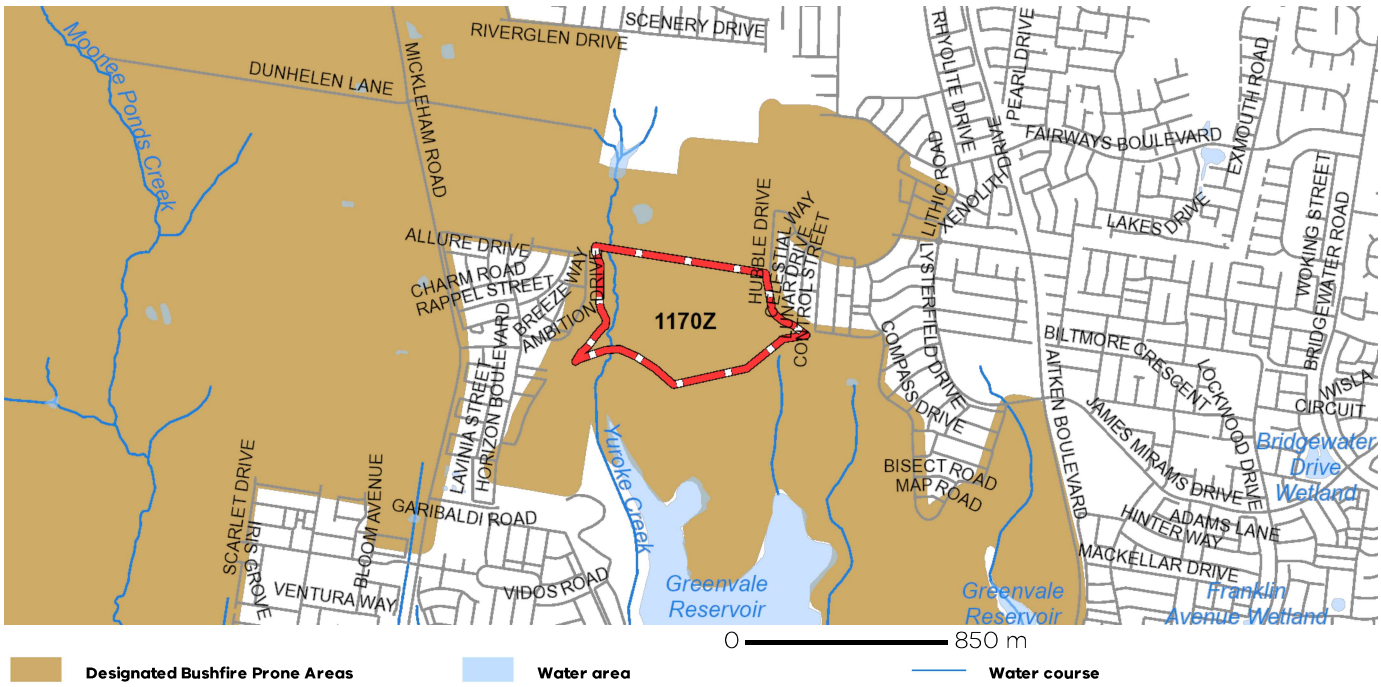
To view planning zones, overlay and heritage information in an interactive format visit https://mapshare.maps.vic.gov.au/vicplan

For other information about planning in Victoria visit https://www.planning.vic.gov.au

PLANNING PROPERTY REPORT

Designated Bushfire Prone Areas

This property is in a designated bushfire prone area.
Special bushfire construction requirements apply. Planning provisions may apply.



Designated bushfire prone areas as determined by the Minister for Planning are in effect from 8 September 2011 and amended from time to time.

The Building Regulations 2018 through application of the Building Code of Australia, apply bushfire protection standards for building works in designated bushfire prone areas.

Designated bushfire prone areas maps can be viewed on VicPlan at https://mapshare.maps.vic.gov.au/vicplan or at the relevant local council.

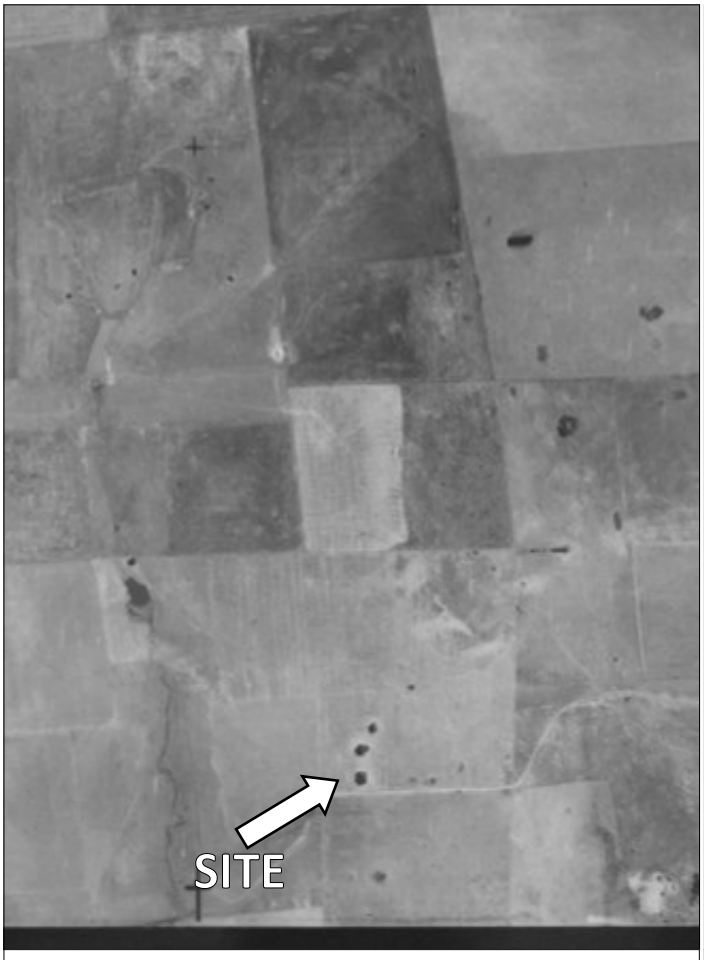
Note: prior to 8 September 2011, the whole of Victoria was designated as bushfire prone area for the purposes of the building control system.

Further information about the building control system and building in bushfire prone areas can be found on the Victorian Building Authority website https://www.vba.vic.gov.au

Copies of the Building Act and Building Regulations are available from http://www.legislation.vic.gov.au

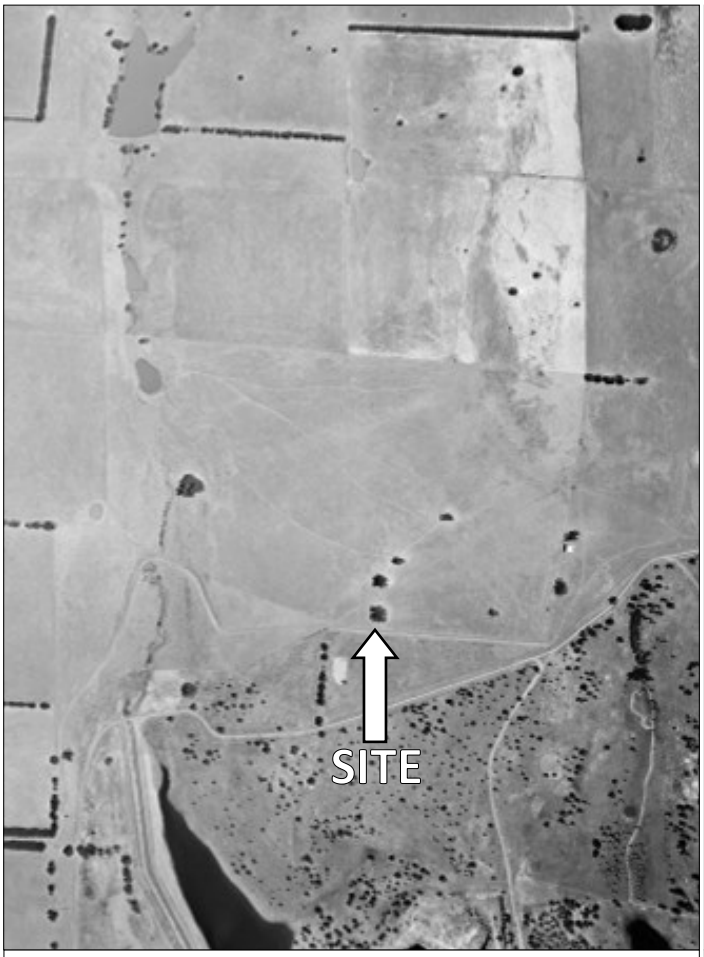
For Planning Scheme Provisions in bushfire areas visit https://www.planning.vic.gov.au

APPENDIX B AERIAL PHOTOGRAPHS



1951

1970



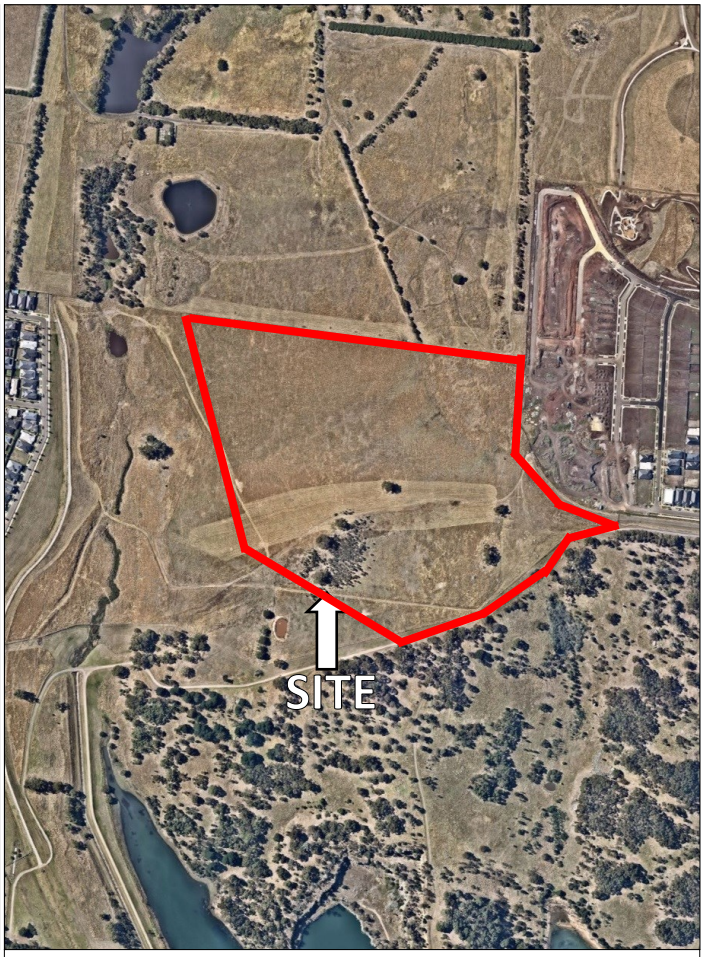
1984

1991

2010

2016

2019



2022

APPENDIX C SITE PHOTOGRAPHS

Photograph 1: View of the northeast portion of the site, taken taking north. Site elevation was highest in the northeast corner and had a steady downward gradient to the west. Basalt floaters were observed in the northeast portion of the site.

Photograph 2: View of the site, taken facing west. Basalt floaters were observed in the northeast portion of the site. Site elevation was highest in the northeast corner and had a steady downward gradient to the west.

Photograph 3: View of topsoil in the northeast portion of the site. Low-lying grass and weeds were observed in the area. Soil had a slight soapy texture when wetted.

Photograph 4: View of the central portion of the site, taken facing south.

Photograph 5: View of the central portion of the site, taken facing south.

Photograph 6: View of topsoil from the central portion of the site, taken facing south.

Photograph 7: View of the western site boundary, taken facing south. Ground elevation falls off sharply offsite to the west towards Yuroke Creek.

Photograph 8: View of the western site boundary, taken facing north. Ground elevation falls off sharply offsite to the west towards Yuroke Creek.

Photograph 9: View of topsoil in the northwest portion of the site.

Photograph 10: View of the southwest corner of the site, taken facing west. Ground elevation falls off sharply offsite to the west towards Yuroke Creek.

Photograph 11: View of topsoil in the southwest portion of the site.

Photograph 12: View of a water asset in the central/southern portion of the site. Vegetation visibly greener downstream of the asset.

Photograph 13: View of the soil profile within the onsite track in the southern portion of the site. Sandy clay fill material was present within the track.

Photograph 14: View of a disused fuel storage / boiler tank in the eastern portion of the site. The tank was empty and open on one side.

APPENDIX D SURFACE SAMPLE DESCRIPTIONS

Beveridge Williams
development & environment consultants

Soil Sample Descriptions

Job no:	2200924

Client:	Satterley Property Group	Logged by:	J.Tillig
Project:	Phase 1 Soil Contamination and Sodicity Assessment	Prepared by:	J.Tillig
Location:	1170Z Mickleham Rd, Greenvale	Checked by:	A.Hayes

Sample ID	Date	Duplicate/split	Depth (m)	PID (ppm)	CR	Sample description	Sample Analysed
220513-SS01	13/05/2022	-	0.0-0.1	0.0	0	ML - SILT; low plasticity; brown; some sand: fine-grained, sub-angular, gap-graded; with rootlets; no odour; moist; light loamy texture, slightly powdery	▲
220513-SS02	13/05/2022	-	0.0-0.1	0.0	0	ML - clayey SILT; low plasticity; brown; trace sand: fine-grained, sub-angular, gap-graded; no odour; moist; more cohesive, less powdery	▲
220513-SS03	13/05/2022	-	0.0-0.1	0.0	0	ML - clayey SILT; low plasticity; brown; trace sand: fine-grained, sub-angular, gap-graded; no odour; moist; more cohesive, less powdery	▲
220513-SS04	13/05/2022	-	0.0-0.1	0.0	0	ML - clayey SILT; low plasticity; dark brown; trace sand: fine-grained, sub-angular, gap-graded; no odour; moist; more cohesive, less powdery	▲
220513-SS05	13/05/2022	-	0.0-0.1	0.0	0	ML - clayey SILT; low plasticity; dark brown; trace sand: fine-grained, sub-angular, gap-graded; no odour; moist; more cohesive, less powdery	▲
220513-SS06	13/05/2022	-	0.2-0.3	0.0	0	SC - clayey SAND; medium to coarse grained, sub-angular, gap-graded; pink mottled brown; no odour; moist	

APPENDIX E NATA LABORATORY CERTIFICATES OF ANALYSIS

Chain of Custody Form

Beveridge Williams
development & environment consultants

		Job number	2200924
		Laboratory	ALS Water Resources Group
Client	**Satterley Property Group**	**Quote number**	**2018-085A LTP 1907**
Project	**Phase 1 Contamination Assessment**	**Project Manager**	A.Hayes
Location	**1170Z Mickleham Rd, Greenvale**	**Sampled by**	J.Tillig

Turnaround time	24hr ☐	48hr ☐	72hr ☐	Standard ☒	Comments:

Chain of Custody

From	Company	Date	Received by	Company	Date	Time
J.Tillig	Beveridge Williams	13/05/2022		ALS	13/5/2022	11.30AM

Quality control		**Initial**
Sample preservation	Appropriate sample containers used, refrigerated or chilled samples supplied to laboratory	J.T
Sample holding times	Tests conducted within specified holding times	J.T
Final certificates	Re-testing of results as requested. Tests conducted and reported as per CoC form.	J.T

Notes

Matrix: S = Soil GW = Groundwater W = Water R = Rinsate Soluble Heavy Metals: Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, Pb, Sb, Se, Sn, V, Zn

Soil: A-S-BEV-W1 (HM/OCP) A-S-BEV-W2 (HM/PAH) A-S-BEV-W3 (HM/PAH/OCP) A-S-BEV-W4 (HM/TPH/PAH) A-S-BEV-W5 (EPA 621 w/ extra metals)

Water: A-W-BEV-W1 (EPA Table 2, TDS, pH, anions/cations, low level: PAH, OCP, TPH) A--BWANZLL (ANZECC screen, low level metals & organics)

All groundwater heavy metals testing must be for soluble metals unless otherwise indicated.

Beveridge Williams				**Job Number**									
				Testing required									
Sample ID	**Date sampled**	**Matrix**	**No. of containers**	**WD004 - Exchangeable Cations (Ca, Mg, Na, K, Al) + Cation Exchange Capacity (CEC)–**	**pH (1:5)**	**pH (CaCl2)**	**Electrical conductivity (EC)**						
220513-SS01	13/05/2022	S	1	x	x	x	x						
220513-SS02	13/05/2022	S	1	x	x	x	x						
220513-SS03	13/05/2022	S	1	x	x	x	x						
220513-SS04	13/05/2022	S	1	x	x	x	x						
220513-SS05	13/05/2022	S	1	x	x	x	x						
220513-SS06	13/05/2022	S	1										

CERTIFICATE OF ANALYSIS

Batch No: **22-44597**
Final Report 3677

Client: **Beveridge Williams & Co Pty Ltd**
Contact: **MR. Adam Hayes**
Address: 1 Glenferrie Road
MALVERN
VIC
3144
AUSTRALIA
Client Program Ref: **2200924**
ALS Program Ref: **BEVWILL**
PO No: **Not Available**

Laboratory Scoresby Laboratory
Address Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
Phone 03 8756 8000
Fax 03 9763 1862
Contact: Le Trang Phan
Client Manager
Le-Trang.Phan@alsglobal.com

Date Sampled: 13-May-2022
Date Samples Received: 13-May-2022
Date Issued: **31-May-2022**

The hash (#) below indicates methods not covered by NATA accreditation in the performance of this service .

Analysis	*Method*	*Laboratory*	*Analysis*	*Method*	*Laboratory*	*Analysis*	*Method*	*Laboratory*
CEC	WD003		**EC**	WA010		**Exch. Cations**	WD004	
pH	EA002		**pH CaCl2**	# EA001-002				

Measurement Uncertainties values for your compliance results are available at this link
Samples not collected by ALS and are tested as received.
A blank space indicates no test performed. Soil microbiological testing was commenced within 4 days from the day collected unless otherwise stated.

Calculated results are based on raw data.

Name	*Title*	*Name*	*Title*
Chatura Perera	**Team Leader Nutrients**	**Ricky Singh**	**Analyst**

Batch No: **22-44597**
Report Number: **3677**
Client: **Beveridge Williams & Co Pty Ltd**
Client Program Ref: **2200924**

LOR = Limit of reporting. When a reported LOR is higher than the standard LOR, this may be due to high moisture content, insufficient sample or matrix interference.
CAS Number = Chemistry Abstract Services Number. The analytical procedures in this report (including in house methods) are developed from internationally recognised procedures such as those published by USEPA, APHA and NEPM.

					Sample No.	170302	170303	170304	170305	170306
					Client Sample ID	220513-SS01	220513-SS02	220513-SS03	220513-SS04	220513-SS05
					Sample Date	13/05/22	13/05/22	13/05/22	13/05/22	13/05/22
					Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
Analysis	**Analyte**		**CAS #**							
Exch. Cations	Exchangeable Aluminium	7249-90-5	<0.056	cmol(+)/kg		<0.056	<0.056	<0.056	<0.056	<0.056
Exch. Cations	Exchangeable Calcium	7440-70-2		cmol(+)/kg		5.1	4.7	5.3	4.2	2.6
Exch. Cations	Exchangeable Potassium	7440-09-7		cmol(+)/kg		1.5	0.76	0.78	0.54	0.43
Exch. Cations	Exchangeable Magnesium	7439-95-4		cmol(+)/kg		3.0	5.7	5.7	5.6	2.1
Exch. Cations	Exchangeable Sodium	7440-23-5		cmol(+)/kg		0.28	0.92	0.49	1.4	0.33
Analysis	**Analyte**		**CAS #**							
pH	pH, units	pH_Lab	<0.1	Units		5.4	5.6	6.2	6.4	5.7
pH CaCl2	pH sediment, 0.01M calcium	PH	<0.1	Units		4.9	4.7	5.0	5.0	4.8
EC	EC, uS/cm @ 25C	E.	<2	uS/cm		40	110	25	51	56
CEC	Cation exchange capacity	CEC		meq/100g		30	19	20	14	12