

22 December 2023
Our ref: JF/C14369

Adhami Pender Architecture
Via email: nabil@adhamipender.com

Attention: Nabil Adhami

Dear Sir

**PROPOSED RESIDENCE
217A BEACH ROAD, DENHAMS BEACH, NSW**

PRELIMINARY ENVIRONMENTAL ASSESSMENT REPORT

We are pleased to present our preliminary environmental assessment report for the proposed residence at 217a Beach Road, in Denhams Beach, NSW.

Adhami Pender Architecture engaged ACT Geotechnical Engineers to undertake a 'Phase 1' preliminary site investigation with soil sampling at 217a Beach Road in Denhams Beach, NSW, to assess the suitability of the site for the proposed residential development. The area that was the subject of this investigation is legally described as Lot 2 of DP 773132 and is approximately 1070m² in size.

The objective of this investigation was to assess the site for potentially contaminating activities that may have occurred on the site or on adjacent properties that may affect the suitability of the site for the proposed development.

The scope of the investigation included the following:

- A site walkover to assess the presence of any pre-existing wastes or material stored on site.
- Reviewing the site history using aerial photographs and undertaking limited soil samples from four (4) boreholes drilled to a maximum depth of 1.0m.
- Laboratory testing of the soil samples for Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylenes, Naphthalene (BTEXN), Organochlorine Pesticides (OCP), Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), Heavy Metals and Asbestos.

A summary of the results of this investigation is provided below:

- Based on a review of the site history, surface and sub-surface samples were collected and analysed.
- Fill was encountered at borehole locations 1A, 2A and 3A.
- The natural material comprised of residual/colluvial soils and extremely weathered shale bedrock.
- Loose construction debris (bricks, concrete, etc.) and several small pieces of fibrous sheeting (potentially asbestos) were noted during sampling. No olfactory indicators of contamination were noted and no staining was observed in the soil from the boreholes.

- Concentrations of TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos in the samples analysed were below the laboratory limit of reporting and therefore below the adopted assessment criteria.
- The level of analytes evaluated in the soil samples were below detection limits or less than the NEPC (1999) thresholds for residential threshold land-uses.

Based on the results of this investigation, the site is considered suitable for all the permissible land uses under the R2: Low Density Residential zone use, including the proposed development from a contamination perspective.

Due to the presence of anthropogenic asbestos identified during sampling, and detection of organic fibres during laboratory testing, it is recommended to strip the entire surface material of the site after the current construction activities are completed.

While it is unlikely, after stripping the surface material, that contamination may be encountered during future construction works, it is recommended that an unexpected finds protocol (UFP), with management procedures for asbestos, is implemented prior to construction works commencing. The UFP will assist the construction contractor with identifying and managing any unexpected occurrences of contaminated material.

This investigation has not been completed with the intention of removing soil from the site. Should the removal of soil be necessary, then a soil classification report must be submitted to the Environmental Protection Authority (EPA) in accordance with the requirements of Information Sheet 4 'Requirements for the Reuse and Disposal of Contaminated Soil'.

Should you require any further information, please do not hesitate to contact our office.

Yours faithfully,

ACT Geotechnical Engineers Pty Ltd



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ADHAMI PENDER ARCHITECTURE

**PROPOSED RESIDENCE
217A BEACH ROAD, DENHAMS BEACH, NSW**

PRELIMINARY ENVIRONMENTAL ASSESSMENT REPORT

DECEMBER 2023

ADHAMI PENDER ARCHITECTURE

PROPOSED RESIDENCE
217A BEACH ROAD, DENHAMS BEACH, NSW

PRELIMINARY ENVIRONMENTAL ASSESSMENT REPORT

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ADHAMI PENDER ARCHITECTURE

PROPOSED RESIDENCE 217A BEACH ROAD, DENHAM'S BEACH, NSW

PRELIMINARY ENVIRONMENTAL ASSESSMENT REPORT

1 INTRODUCTION

At the request of Adhami Pender Architecture, ACT Geotechnical Engineers Pty Ltd carried out a preliminary environmental assessment for a proposed residential development at 217a Beach Road in Denham's Beach, NSW. The project involves the construction of a new two-storey residence with a single-level basement cut ~3m into the sloping site. Therefore, for the purposes of this assessment, the site is considered as residential land-use.

The site was formerly occupied by a residential cottage, and has also been used for storage of construction materials and equipment. Adhami Pender Architecture requested a contamination assessment to determine the current soil contamination status of the site and to confirm suitability for proposed land-use for due diligence, prior to any proposed development.

2 SCOPE OF WORK

ACT Geotechnical Engineers Pty Ltd was commissioned by Adhami Pender Architecture to undertake a preliminary environmental assessment in accordance with the contaminated land management planning guidelines, from the *Contaminated Land Management Act 1997* (CLM Act 1997) and the *State Environmental Policy No. 55 (SEPP 55)* on the proposed development at 217a Beach Road, Denham's Beach, NSW. The objective was to identify potentially contaminating activities of the lot, identify potential contamination types, discuss the site condition, provide a preliminary assessment of possible site contamination and assess the need for further investigation.

The investigation was completed by ACT Geotechnical Engineers Pty Ltd. The scope of work completed as a part of the environmental investigation was as follows:

- Perform a site visit to characterise the property setting, including inspection of the site surface for obvious and visible signs of potential contamination and / or contaminant sources.
- A visual evaluation of surrounding land uses to identify any neighbouring activities which may present a potential risk to health of future occupants and the overall environmental quality of the site.
- An evaluation of aerial photographs to assist in assessing historical land uses and conditions both on and adjacent to the site.
- A review of the environmental setting with regards to geology, topography, hydrology, and hydrogeology.
- Undertake an intrusive site investigation across the site including advancing four (4) borehole for soil sampling within the site.
- Soil samples were collected from each of the four (4) boreholes.
- Undertake soil analysis at a National Association of Testing Authorities (NATA) accredited laboratory for the analyses of the following contaminants of potential concern (COPC):
 - Total recoverable hydrocarbons (TRH);
 - Benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN);

- Organochlorine pesticides (OCP);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Polychlorinated Biphenyls (PCBs)
- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Asbestos.
- Assess laboratory results obtained from the investigation against the applicable land use criteria.
- Prepare a detailed investigation report presenting the results of the investigation.

The findings of the report are based on the Scope of Work outlined above. ACT Geotechnical Engineers has performed services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties expressed or implied, are made.

The assessment was limited strictly to identifying typical environmental conditions associated with the subject property area and does not include evaluation of any other issues. The absence of any identified hazardous or toxic materials on the subject property should not be interpreted as a guarantee that such materials do not exist on the site.

3 SITE CHARACTERISTICS

The site location and a detailed site plan are presented as Figure 2, Appendix A.

3.1 Site Location and Description

Address	217a Beach Road, Denhams Beach, NSW
Client	Adhami Pender Architecture
Deposited Plans	Lot 7, DP 773132
Locality map	Figure 1
Aerial Photograph	Figure 2
Area	Approximately 1,070m ²
Land Zoning	R2: Low Density Residential
Current land Use	Construction Material and Equipment Storage/ Previously occupied by a cottage, which has been demolished.

The following description is based on observations made during the site visit conducted during borehole drilling on 22 November 2023:

- The development site is presently vacant, used as storage for construction equipment/materials and as machinery access for adjacent lots.
- Skip bins, cleared vegetation, stockpiles of gabion rock and excavated soil material, a mobile crane, and an excavator are currently being stored on site.
- The investigation area is bounded by Beach Road to the west, coastline to the east and other residential blocks to the north and south.

- Loose construction debris (bricks, concrete, etc.) and several small pieces of fibrous sheeting (potentially asbestos) were noted during sampling. No olfactory indicators of contamination were noted.
- The steep slope at the rear (east) of the site had been cleared of vegetation (apart from ~7-8 trees) and had exposed weak shale bedrock with some overlying colluvial soil.

3.2 Surrounding Land Uses

A summary of the land uses that surround the site are as follows:

- **North:** Low density residential block (2/217 Beach Road, Denhams Beach, NSW)
- **South:** Low density residential block (219a Beach Road, Denhams Beach, NSW)
- **West:** Beach Road
- **East:** Coastline classified as Environmental Conservation land zoning

Historically the site was occupied by a residential cottage and has more recently been used for storage of construction materials and equipment, which may have contaminated the investigation area. Specifically, asbestos from the old demolition works on an unfenced site within the lot is a known concern. Historical and present surrounding land-uses of other sites are not expected to impact the site.

3.3 Sensitive Environment

The closest sensitive environment is the Batemans Marine Park Habitat Protection Zone, which is located directly adjacent to the eastern boundary of the site. This adjacent area is also classified as an environmental conservation area within the Eurobodalla Local Environment Plan 2012.

3.4 Proposed Land Uses

The proposed land use is the construction of a two-storey residence.

4 SITE HISTORY

4.1 Zoning

The investigation area is zoned R2: Low Density Residential under the Environmental Planning and Assessment Act 1979.

4.2 Land-use

The development site is presently vacant and is being used for storage of construction equipment and materials. Skip bins, cleared vegetation, stockpiles of gabion rock and excavated soil material, a mobile crane, and an excavator are currently being stored on site. Loose construction debris is also scattered across the ground surface.

4.3 Sources of information

- NSW EPA records of public notices under the Contaminated Land Management Act 1997
- Soil and geological maps
- Topographical map
- Aerial photographs (1961, 1969, 1979, 1989, 1997, 2005, 2012, 2015, 2020, 2023)
- Historical Maps (1971, 2015)
- Lotsearch record
- Site inspection 22 November 2023

4.4 Historical site review

A Lotsearch (Environmental Risk Report) was requested, which included historical aerial photographs of the site. These were reviewed to assist with assessing the history of the site. A summary of each photograph examined as a part of the investigation is provided in Section 4.4.1 below and the Lotsearch report in **Appendix D**.

4.4.1 Historical aerial photographs and Historical Map

Year	Site land-use observations	Surrounding land-use
1961	The investigation area appears to be occupied by a residential home.	Beach Road is present to the west of the site within the 150m buffer distance. To the north, south and west, a couple of other lots are also occupied by residential dwellings within the 150m buffer distance. Thick vegetation surrounds the site.
1969	The site does not exhibit any discernible differences.	Further residential development has commenced in all directions of the site, both inside and outside of the buffer distance.
1979	The site does not exhibit any discernible differences.	Beach Road, and other surrounding roads, have been paved. Residential development is on-going in all directions of the site.
1989	The residence on the site has been demolished.	Residential development is on-going in all directions of the site, particularly to the west of the site, outside the buffer distance. New roads have also been added to the west. Significant vegetation removal has occurred to accommodate this.
1997	The site does not exhibit any discernible differences.	More residential dwellings have been constructed in all directions of the site. More removal of vegetation.
2005	The site has been stripped of grass.	The residential lot to the north of the site appears to have constructed an extension.
2012	Equipment/vehicles are being stored on the site.	No changes are evident to the land surrounding the site.
2015	Grass has regrown over the site. Equipment/vehicles are still being stored on the site	No changes are evident to the land surrounding the site.
2020	The site does not exhibit any discernible differences.	No changes are evident to the land surrounding the site.
2023	More construction equipment is being stored on site, as well as other construction debris and stockpiles	No changes are evident to the land surrounding the site.

4.4.2 EPA Contaminated Search

No recorded contamination activities of the licensed activities under the Protection of the Environmental Operations Act 1997 were identified at 217a Beach Road, Denhams Beach, NSW.

4.4.3 Manufacturing Processes

There are no known manufacturing processes that currently occur or have previously occurred on the site.

4.4.4 Discharges to Land, Water and Air

No information regarding discharges to land, water and air was available for review at the time of writing this report. As no manufacturing operations are known to have occurred at the site, it is unlikely that there may have been previous discharges to land, water, or air in the past.

4.5 Contaminant sources

Potential contamination sources include the demolition works of the original residential cottage, and the storage of construction equipment/materials on the lot. Asbestos is a known concern from the demolition works. Other more recent activities on the lot may have led to TRH, BTEXN, OCP, PAH, PCB, and heavy metal contamination.

4.6 Relevant complaint history

No complaint history known.

4.7 Contaminated site register

The investigation area is not listed on the NSW EPA register of contaminated sites.

4.8 Previous investigations

No previous contamination investigations are known to have been undertaken on the site.

4.9 Integrity assessment

The site history was obtained from a site inspection and history review. The information is consistent with the current site condition and is accurate to the best of the assessor's knowledge.

5 SITE CONDITIONS AND ENVIRONMENTAL SETTING

5.1 Topography

The western side of the site has an elevation of approximately ~RL30m above the Australian Height Datum (m AHD) and dips gently east.

The steep bank on the eastern side of the block is ~22m high and dips at an angle of ~40 degrees, with steep sections reaching 60 degrees.

5.2 Indication of Contamination

Loose construction debris (bricks, concrete, etc.) and several small pieces of fibrous sheeting (potentially asbestos) were noted during sampling. No olfactory indicators of contamination or staining were noted.

5.3 Indication of Acid Sulphate Soils

A review of the Australian Soil Resource Information System (ASRIS) map and Lotsearch Report shows the subject site to be situated in an area of 'low probability for acid sulfate soil occurrence'.

5.4 Geology

The 1:100,000 Ulladulla Geology map documents the area to be underlain by Cambrian age Wagonga Beds, comprising chert, conglomerate, agglomerate, slate, sandstone and phyllite.

5.5 Hydrogeology

5.5.1 Surface water

Surface water flows mostly in an easterly direction towards the coast. No dams, permanent streams or lakes were identified on the development site.

5.5.2 Groundwater

A groundwater bore search was provided within the Lotsearch report (**Appendix D**). The purpose of the bore search was to document the location and depth of any nearby registered groundwater bores, and the associated quality of the groundwater so that potential impacts of contaminants from the site or surrounding land uses (if any) on local users of groundwater may be assessed.

Three (3) groundwater bores are located within 400m to 600m north-west of the investigation area. The bores are licensed for water supply.

NSW Bore ID	Date drilled	Direction from site	Distance from site	Status	SWL	Salinity	Depth
GW105996	27/05/2005	North	458m	Functioning	13.50 mbgl	1000 mg/L	38m
GW105984	24/10/2003	North West	482m	Functioning	4.5 mbgl	900 mg/L	30.5m
GW103858	30/09/1998	North West	558m	Unknown	7.0 mbgl	1500 mg/L	21m

Based on the topography of the site and the nearest water body, the groundwater flow direction is inferred to be in an overall easterly direction towards the coast.

5.6 Sensitive Environments

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km include:

- Regent Honeyeater – Critically Endangered, Category 2 Sensitive Species
- Gang-Gang Cockatoo – Vulnerable, Category 3 Sensitive Species
- South-eastern Glossy Black-Cockatoo – Vulnerable, Category 2 Sensitive Species
- Leafless Tongue Orchid – Vulnerable, Category 2 Sensitive Species
- East Lynne Midge Orchid – Vulnerable, Category 2 Sensitive Species

6 CONCEPTUAL SITE MODEL

Conceptual site models (CSM) are a method of presenting site contamination information and the relationships between sources of contamination, how it may have been introduced to the site, possible pathways for contaminant migration and exposure, and the receptors that may be affected by contaminants.

The following conceptual site model has been prepared based on the information presented in the Lotsearch Report, document searches and site's fieldwork.

The preliminary CSM is presented in the sections below.

6.1 Sources of contamination

Potential contamination sources include the demolition works of the original residential cottage, and the storage of construction equipment/materials on the lot. Asbestos is a known concern from the demolition works. Other more recent activities on the lot may have led to TRH, BTEXN, OCP, PAH, PCB, and heavy metal contamination.

6.2 Contaminants of concern

Based on the historical activities and site inspection the contaminants of concern are:

- Heavy metals (arsenic, cadmium, chromium, copper, nickel, lead, mercury and zinc)
- Total Recoverable Hydrocarbons (TRH)
- Benzene, Toluene, Ethylbenzene and Xylene (BTEXN)
- Organochlorine Pesticides (OCP)
- Polycyclic Aromatic Hydrocarbons (PAH)
- Polychlorinated Biphenyls (PCB) and
- Asbestos.

6.3 Potential receptors

The proposed land-use of the investigation area is residential. Surface water is expected to flow in an easterly direction towards the coastline.

Human receptors include

- On-site works during site development
- Site workers and site visitors
- Intrusive maintenance workers

Ecological receptors include

- Vegetation on the site and adjacent to the site
- Aquatic/marine receptors adjacent to the site and via surface water run-off

6.4 Exposure pathways

Pathways for exposure to contaminants are:

- Dermal contact following soil disturbance
- Ingestion after soil disturbance
- Inhalation of dust after soil disturbance
- Surface water and sediment runoff into nearby waterways
- Leaching of contaminants into the groundwater
- Direct contact of flora and fauna with the soil

6.5 Source receptor linkages

Potential source pathway receptor linkages are identified to enable evaluation of any adverse impact on human health or ecology.

The investigation area is currently vacant, however, construction work for the residential development has been proposed and therefore human receptors to the investigation area are possible. Proposed users of the site may have a risk of exposure if the contaminants are present and

the soil is disturbed. Intrusive maintenance workers may also have an increased risk of exposure to contaminants during soil disturbance.

Source/contaminants	Transport	Potential exposure pathways	Receptors
<ul style="list-style-type: none"> ■ Heavy metals from the historical land-use ■ Hydrocarbons impacted from the historical land-use 	<ul style="list-style-type: none"> □ Volatilisation ■ Surface water ■ Groundwater ■ Wind ■ Sedimentation 	<ul style="list-style-type: none"> ■ Direct contact (ingestion and absorption) □ Inhalation □ Ingestion 	<ul style="list-style-type: none"> ■ On-site workers/visitors ■ Residents/staff ■ Intrusive maintenance and construction workers ■ Ecosystem

■ Potential, □ unknown/unlikely

7 DATA QUALITY OBJECTIVES (DQO)

7.1 State the problem

Historical and surrounding current land-uses may have resulted in contamination. A contamination assessment is required to determine the current soil contamination status and confirm suitability for proposed land-use.

7.2 Identify the decision

The proposed land use is residential land-use. The decision problem is, do the levels of potential contaminants exceed the assessment criteria listed in Section 10.

7.3 Identify the inputs decision

Investigations of the site are required to identify any potential contaminants from historical and current land-use.

7.4 Develop a decision rule

The initial guidelines for soil were the health and ecological investigation levels for residential land-use (NEPC 1999).

If soil contamination was identified, then the contaminant source and extent of contamination was determined.

7.5 Specify acceptable limits on the decision errors.

The 95% upper confidence limit of average levels of samples collected is less than the threshold levels and the results are less than 250% of relevant thresholds.

7.6 Optimize the design for obtaining data

Evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets all DQOs. Soil samples were collected from the proposed development site covering the north, east, south and west.

Analytes evaluated included TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos.

8 SAMPLING ANALYSIS PLAN AND SAMPLING METHODOLOGY

8.1 Sampling design

A soil investigation was undertaken by four (4) augered boreholes to a target depth of 1.0m (or into natural soil). The geological profile of the soil was described for each borehole, including any detection of hydrocarbon odour and staining.

Discrete soil samples were collected at each borehole location. The representative soil samples were submitted for laboratory analysis.

Schedule of samples collected for laboratory analysis is outlined in Table 1. Sampling locations are presented in Figure 2.

8.1.1 Sampling locations

Discrete soil samples were collected from the borehole locations. A total of ten (10) discrete soil samples were collected for analysis (Figure 2).

8.1.2 Sampling depth

Soil boring and descriptions were undertaken at the borehole locations. Target sampling was from surface level to 200mm/500mm (natural soil) across most of the site.

8.2 Analytes

Soil samples were evaluated for TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos.

8.3 Sampling methods

Four (4) boreholes (1A to 4A) were drilled across the investigation area on 22 November 2023 using a 100mm hand auger to a target depth of 1.0m (or into natural soil). Soil was taken at each individual sampling location and depth.

Discrete soil samples were transferred directly to a solvent rinsed glass jar with a Teflon lid.

Tools were decontaminated between sampling locations to prevent cross contamination by brushing to remove caked or encrusted material, washing in detergent and tap water.

After collection, samples were placed in an insulated container with ice bricks and refrigerated shortly after. Transportation to the laboratory for analysis was in insulated containers with ice bricks.

TABLE 1: Schedule of Samples and Analyses

Sample ID	Depth	Location	Analysis undertaken
1A/1D	0.0m – 0.1m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
1A/2D	0.5m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
1A/3D	0.0m – 0.1m	See Figure 2	Asbestos
2A/1D	0.0m – 0.1m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
2A/2D	0.1m – 0.2m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
2A/3D	0.0m – 0.1m	See Figure 2	Asbestos
3A/1D	0.0m – 0.1m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
3A/2D	0.5m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
3A/3D	0.0m – 0.1m	See Figure 2	Asbestos
4A/1D	0.0m – 0.1m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals

9 QUALITY ASSURANCE AND QUALITY CONTROL

9.1 Sampling design

The sampling program is intended to provide data regarding the presence and levels of contaminants in the soil.

Discrete soil samples were collected across the site. The sampling density will enable the detection of an area with a 95% confidence level.

The number and location of samples taken is expected to provide an adequate assurance that the soil samples are representative of the site as a whole.

9.2 Field

The collection of samples was undertaken in accordance with accepted standard protocols (NEPC 1999).

Selected discrete soil samples collected from the site were analysed for TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos.

Sampling equipment was decontaminated between each sampling event. The appropriate storage conditions and duration were observed between sampling and analysis. A chain of custody form accompanied the samples to the laboratory (**Appendix C**).

A single sampler was used to collect the samples using standard methods. Soil collected was a fresh sample from a hand shovel. After collection the samples were immediately placed in new glass sampling jars and placed in a cooler.

No field blank, rinsate, trip blank or matrix spikes were submitted for analysis. A field sampling log is presented in **Appendix B**. Refrigerated storage and transportation in insulated containers with ice bricks by overnight couriers ensured the integrity of the samples. Samples from each batch did not contain detectable levels of some analytes which indicates adequate sampling integrity and no cross contamination in sampling and transport.

9.3 Laboratory

Chemical analysis was conducted by Envirolab Services Pty Ltd, Sydney, which is NATA accredited for the tests undertaken. The laboratories have quality assurance and quality control programs in place, which include internal replication and analysis of spike samples and recoveries.

Method blanks, matrix duplicates and laboratory control samples were within acceptance criteria. The quality assurance and quality control report are presented together with the laboratory report as **Appendix C**.

9.4 Data evaluation

The laboratory quality control report indicates the data variability is within acceptable commercial limits. The data is considered representative and usable for the purposes of the investigation.

Method blanks, matrix spikes, matrix duplicates and laboratory control samples were within acceptance criteria. The quality assurance and quality control report are presented together with the laboratory report in **Appendix C**.

10 ASSESSMENT CRITERIA

The proposed land-use of the site is residential, and the laboratory results were assessed against the relevant criteria.

The health-based investigation levels of contaminants in the soil for a residential site, for the substances for which criteria are available, are listed in Table 2, as recommended in the NEPM (1999).

The NEPM (1999) provides health screening levels (HSL) for hydrocarbons in soil. The HSLs have been developed to be protective of human health for soil types, depths below surface and apply to exposure to hydrocarbons through the predominant vapour exposure pathway. The appropriate HSL for the site is listed in Table 3. TRH>C16 have physical properties which make the TRH fractions non-volatiles and therefore these TRH fractions are not limiting for vapour intrusion.

Ecological investigation levels (EIL) have been developed for the protection of terrestrial ecosystems for selected metals and organic substances in the soil in the guideline (NEPC 1999). Ecological screening levels (ESL) assess the risk to terrestrial ecosystems from petroleum hydrocarbons in the soil. The EILs and ESLs consider the properties of the soil and contaminants and the capacity of the local ecosystem to accommodate increases in contaminant levels. EILs vary with land-use and apply to contaminants up to 2m depth below the surface. The EILs for residential land-use are listed in Table 4. ESLs are dependent on land-use, soil types and are applicable to contaminants up to 2m below the surface. The appropriate ESLs for the site are listed in Table 3.

Management limits have been developed to assess petroleum hydrocarbons following evaluation of human health and ecological risks (NEPC 1999). Management units are applicable as screening levels after consideration of relevant ESLs and HSLs. The appropriate management limit for the site is listed in Table 3.

Typical CEC values for soils in the locality include 10cmol(+)/kg, pH values of between 5 and 6, organic carbon of 2% and clay content of 20 to 30% (Espade, 2019). The proposed land-use is low density residential.

TABLE 2: Health Investigation Levels (HIL) – Residential A Land-Use Category (NEPC 1999)

Analyte	HIL Residential A (mg/kg)
Arsenic	100
Cadmium	20
Chromium (VI)	100
Copper	7,000
Lead	300
Nickel	400
Zinc	8,000
Mercury	7
DDT+DDE+DDD	260
PAHs (total)	300
PCBs (total)	1

HIL – health investigation level

TABLE 3: Investigation and Screening Levels (HSL) – Residential A Land-Use Category/Urban Residential and public open space land-use (NEPC 1999)

Analyte	HSL-A Residential / clay soil (mg/kg)			ESL Urban residential and public open space (mg/kg)	Management limits for TRH Residential, Parkland and public open space (mg/kg)
	0m to <1m	1m to <2m	2m to <4m		
TRH (C6-C10)	60	100	180	180	800
TRH (>C10-C16)	330	NL	NL	120	1,000
TRH (>C16-C34)	NA	NA	NA	1,300	3,500
TRH (>C34-C40)	NA	NA	NA	5,600	10,000
Benzene	0.8	1	2	65	NA
Toluene	560	NL	NL	105	NA
Ethylbenzene	NL	NL	NL	125	NA
Xylenes	130	310	NL	45	NA
Naphthalene	6	NL	NL	NA	NA

HIL – health investigation level, HSL – health screening level, EIL – ecological investigation level, ESL – ecological screening level, NL – non limiting, NA – not applicable

TABLE 4: EIL Calculation sheet – Urban residential and public open space land-use (NEPC 1999)

Analyte	Rationale	ACL (mg/kg)	ABC (mg/kg)	EIL (mg/kg)
Zinc	CEC 10cmol/kg, pH 5.5	270	0	270
Copper	pH 5.5	130	0	130
Nickel	CEC 10cmol/kg	170	0	170
Lead	Generic	1,100	0	1,100
Arsenic	Aged	100	0	100
DDT	Aged	180	0	180
Naphthalene	Aged	170	0	170

ACL – added contaminant limit, ABC – ambient background concentration, EIL – Ecological investigation limit (ACL+ABC)

11 RESULTS

11.1 Soil Results

The findings from site inspection and laboratory analytical results of the investigation area presented in the following sections.

11.2 Visual Observations / Field Measurements

The majority of the surface of the site was covered by topsoil and fill material. No surface staining was detected on the site.

Uncontrolled fill material and topsoil was encountered in boreholes 1A, 2A and 3A to a depth of 0.1m/0.5m.

The natural colluvial/residual soil and extremely weathered shale bedrock was encountered below the fill in all boreholes.

Loose construction debris (bricks, concrete, etc.) and several small pieces of fibrous sheeting (potentially asbestos) were noted during sampling. No olfactory indicators of contamination or staining were noted.

A copy of the sampling log is presented in **Appendix B**.

11.3 Analytical Results

The levels of all substances analysed in the soil samples (Table 5-9) collected from the site were not detected or at environmental background levels for proposed residential land-use thresholds (NEPM 1999).

TABLE 5: Analytical results and threshold concentrations (mg/kg)

Sample ID	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Mercury (mg/kg)
1A/1D (0.0m – 0.1m)	86	<0.4	9	23	15	2	9	<0.1
1A/2D (0.5m)	29	<0.4	7	20	16	2	42	<0.1
2A/1D (0.0m – 0.1m)	13	<0.4	6	19	15	1	31	<0.1
2A/2D (0.1m – 0.2m)	27	<0.4	8	22	27	2	48	<0.1
3A/1D (0.0m – 0.1m)	30	<0.4	12	22	20	4	90	<0.1
3A/2D (0.5m)	25	<0.4	4	18	8	<1	8	<0.1
4A/1D (0.0m – 0.1m)	33	<0.4	8	26	100	<1	58	<0.1
Health Investigation Levels – Residential A Land-Use								
Disturbed	100	20	100	7,000	300	400	8,000	7
Ecological Investigation Levels – Urban Residential and Public Open Space								
Disturbed	100	NA	NA	130	1,100	170	270	NA

TABLE 6: Analytical results and threshold concentrations for BEXTN

Sample ID	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylene (mg/kg)	Naphthalene (mg/kg)
1A/1D (0.0m – 0.1m)	<0.2	<0.5	<1	<1	<1
1A/2D (0.5m)	<0.2	<0.5	<1	<1	<1
2A/1D (0.0m – 0.1m)	<0.2	<0.5	<1	<1	<1
2A/2D (0.1m – 0.2m)	<0.2	<0.5	<1	<1	<1
3A/1D (0.0m – 0.1m)	<0.2	<0.5	<1	<1	<1
3A/2D (0.5m)	<0.2	<0.5	<1	<1	<1
4A/1D (0.0m – 0.1m)	<0.2	<0.5	<1	<1	<1
Health Screening Levels – Residential A Land-Use / clay soil up to 1.0m depth					
	0.8	560	NL	130	6
Ecological Investigation Levels – Urban Residential and Public Open Space					
	NA	NA	NA	NA	170
Ecological Screening Levels – Urban Residential and Public Open Space					
	65	105	125	45	NA

TABLE 7: Analytical results and threshold concentrations for TRH

Sample ID	C6 – C10 (mg/kg)	>C10 – C16 (mg/kg)	>C16 – C34 (mg/kg)	>C34 (mg/kg)
1A/1D (0.0m – 0.1m)	<50	<50	<100	<100
1A/2D (0.5m)	<50	<50	<100	<100
2A/1D (0.0m – 0.1m)	<50	<50	<100	<100
2A/2D (0.1m – 0.2m)	<50	<50	<100	<100
3A/1D (0.0m – 0.1m)	<50	<50	160	<100
3A/2D (0.5m)	<50	<50	<100	<100
4A/1D (0.0m – 0.1m)	<50	<50	110	<100
Health Screening Levels – Residential A Land-Use / clay soil up to 1.0m depth				
	60	330	NA	NA
Ecological Screening Levels – Urban Residential and Public Open Space				
	180	120	1,300	5,600
Management limits for TRH Residential, Parkland and Public Open Space				
	800	1,000	3,500	10,000

TABLE 8: Analytical results and threshold concentrations for Organochlorine Pesticides, Polycyclic Aromatic Hydrocarbons (PAHs) and PCBs.

Sample ID	DDT+DDE+DDD (mg/kg)	PAHs (sum) (mg/kg)	PCBs (sum) (mg/kg)
1A/1D (0.0m – 0.1m)	<0.1	<0.05	<0.1
1A/2D (0.5m)	<0.1	<0.05	<0.1
2A/1D (0.0m – 0.1m)	<0.1	<0.05	<0.1
2A/2D (0.1m – 0.2m)	<0.1	<0.05	<0.1
3A/1D (0.0m – 0.1m)	<0.1	<0.05	<0.1
3A/2D (0.5m)	<0.1	<0.05	<0.1
4A/1D (0.0m – 0.1m)	<0.1	<0.05	<0.1
Health Investigation Levels – Residential A Land-Use			
	260	300	1
Ecological Investigation Levels – Urban Residential and Public Open Space			
	180	NA	NA

TABLE 9: Analytical results for Asbestos in soil

Sample ID	Analysis	
	Asbestos ID in soil	Trace Analysis
1A/3D (0.0m – 0.1m)	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected
2A/3D (0.0m – 0.1m)	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected
3A/3D (0.0m – 0.1m)	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected

12 SITE CHARACTERISATION

12.1 Chemical degradation production

Not applicable as no contamination was identified.

12.2 Exposed population

Not applicable as no contamination was identified

13 INCIDENT NOTIFICATION/DUTY OF REPORT

13.1 Section 60 Contaminated Land Management Act 1997

Under Section 60 of the CLM Act, a person whose activities have contaminated land or a landowner whose land has been contaminated are required to notify EPA when they become aware of the contamination.

Triggers to notification include:

13.1.1 On-site soil contamination

- the 95% upper confidence limit on the arithmetic average concentration of contamination in or on soil, on the land is equal to, or above the EPA health investigation level or guidelines

OR

- the concentration of a contaminant in an individual soil sample is above two and a half times the EPA investigation level or guideline

AND

- a person has been, or foreseeable will be, exposed to the contaminant or any by-product of the contaminant

Response: No contamination was identified in the soil samples analysed.

13.1.2 Off-site soil contamination

- the 95% upper confidence limit on the arithmetic average concentration of contamination in or on soil, on the land is equal to, or above the EPA health investigation level or guidelines

OR

- the concentration of a contaminant in an individual soil sample is above two and a half times the EPA investigation level or guideline

AND

- the concentration of the contaminant in, or on, the soil on the neighbouring land will foreseeable continue to remain above the specified concentration

Response: No contamination was identified in the soil samples analysed.

13.1.3 Foreseeable contamination of neighbouring land

- the contaminant will foreseeably enter neighbouring land

AND

- the concentration of contamination of neighbouring land is above the above the EPA health investigation level or guidelines

AND

- the concentration of contaminant will foreseeable continue to remain above the specified concentration

Response: No contamination was identified in the soil samples analysed.

13.2 Overall assessment

It is concluded with the information available the appropriate regulatory authority or EPA is not required to be notified as no contamination was identified on the site soil.

14 CONCLUSIONS

The development site is presently vacant and is being used for storage of construction equipment and materials. Samples were collected from the target area.

The soil samples were analysed for TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos.

No hydrocarbon odour was observed in the boreholes. The TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos levels in all soil samples collected were less than the assessment thresholds.

Whilst no asbestos levels were detected at the reporting limit of 0.1 g/kg, organic fibres were detected in all the collected soil samples.

No natural occurrence asbestos (NOA) was identified at the borehole locations, however, several small pieces of fibrous sheeting (potentially anthropogenic asbestos) were identified at the time of the site investigation.

14.1 Assumptions in reaching the conclusions

The assessment is comprised of a desktop study, site inspections, subsoil investigations and soil analysis. It is assumed the sampling sites are representative of the site. An accurate history has been obtained and typical management practices were adopted.

14.2 Extent of uncertainties

The analytical data relates only to the locations sampled. Soil conditions can vary both laterally and vertically and it cannot be excluded that unidentified contaminants may be present.

14.3 Suitability for proposed use of the site

The site is suitable for proposed childcare center/residential land-use.

14.4 Limitations and constraints on the use of the site

No constraints are recommended.

14.5 Recommendations

Due to the presence of anthropogenic asbestos identified during sampling, and detection of organic fibres during laboratory testing, it is recommended to strip the entire surface material to a depth of ~200mm of the site after the current construction activities are completed. Future works would then have to be undertaken under an unexpected finds protocol (UFP), with management procedures for asbestos, which is implemented prior to construction works commencing.

15 REPORT LIMITATIONS AND INTELLECTUAL PROPERTY

This report has been prepared for the use of the client to achieve the objectives given the client requirements. The level of confidence of the conclusion reached is governed by the scope of the investigation and the availability and quality of existing data. Where limitations or uncertainties are known, they are identified in the report. No liability can be accepted for failure to identify conditions or issues which arise in the future and which could not reasonably have been predicted using the scope of the investigation and the information obtained.

The investigation identifies the actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing is interpreted by geologists, engineers or scientists who then render an opinion about overall subsurface conditions, the nature and extent of the contamination. Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock or time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. It is thus important to understand the limitations of the investigation and recognise that we are not responsible for these limitations.

This report, including data contained and its findings and conclusions, remains the intellectual property of ACT Geotechnical Engineer Pty Ltd. This report should not be used by persons or for purposes other than those stated and should not be reproduced without the permission of ACT Geotechnical Pty Ltd.

REFERENCES

NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme (3rd Ed.)

NSW EPA (1995) Sampling Design Guidelines (1995)

NSW EPA (2020) Contaminated Land Guidelines - Consultants Reporting on Contaminated Land

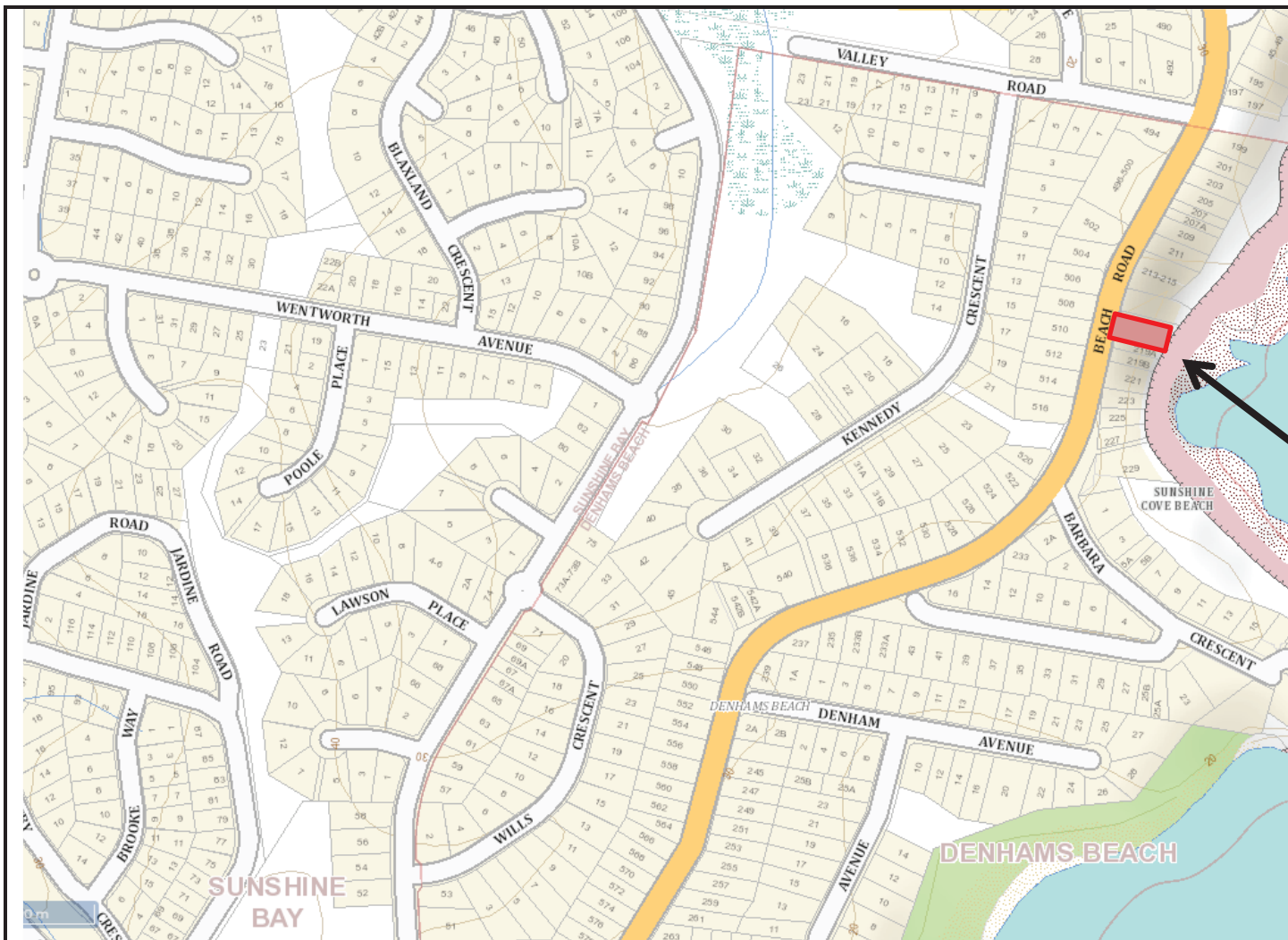
NEPC (1999) *National Environment Protection (Assessment of Site Contamination) Measure 1999 Revised 2013* (National Environment Protection Council Service Corporation, Adelaide)

Bureau of Mineral Resources, Geology and Geophysics (1984) '1:100,000 Hydrogeology of the Australian Capital Territory and Environs'.

NSW Department of Primary Industries (2018), *Batemans Marine Park Zoning Map*, NSW Government.

APPENDIX A

Figures



ADHAMI PENDER ARCHITECTURE
 PROPOSED RESIDENCE – 217A BEACH ROAD, DENHAMS BEACH, NSW
 SITE LOCALITY

ACT Geotechnical Engineers Pty Ltd

C14369



ADHAMI PENDER ARCHITECTURE
PROPOSED RESIDENCE – 217A BEACH ROAD, DENHAMS BEACH, NSW
AERIAL PHOTOGRAPH SHOWING BOREHOLE LOCATIONS

ACT Geotechnical Engineers Pty Ltd

C14369

APPENDIX B

Sampling Log

Appendix B. Field sampling log

Client Adhami Pender Architects

Job number C14369

Location Lot 2 DP773132 Beach Road, Denhams Beach, NSW

Date 22 November 2023

Investigator(s) Jeremy Murray

Weather conditions Warm and sunny

Sample ID	Matrix	Analysis required	Observations/comment
1A/1D	Uncontrolled Fill	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.0m – 0.1m
1A/2D	Colluvial Soil?	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.5m
1A/3D	Uncontrolled Fill	Asbestos	Discrete Sample Depth; 0.0m – 0.1m
2A/1D	Uncontrolled Fill	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.0m – 0.1m
2A/2D	Extremely Weathered Shale Bedrock	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.1m – 0.2m
2A/3D	Uncontrolled Fill	Asbestos	Discrete Sample Depth; 0.0m – 0.1m
3A/1D	Topsoil	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.0m – 0.1m
3A/2D	Extremely Weathered Shale Bedrock	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.5m
3A/3D	Topsoil	Asbestos	Discrete Sample Depth; 0.0m – 0.1m
4A/1D	Residual Soil	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.0m – 0.1m

APPENDIX C
NATA Laboratory Certificate of Analysis, Quality Control and Chain of Custody Documentation

CERTIFICATE OF ANALYSIS 338808

Client Details

Client	ACT Geotechnical Engineers Pty Ltd
Attention	Jeremy Murray
Address	PO Box 9225, DEAKIN, ACT, 2600

Sample Details

Your Reference	<u>217A Beach Road, Denhams Beach, NSW</u>
Number of Samples	10 Soil
Date samples received	28/11/2023
Date completed instructions received	28/11/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	05/12/2023
Date of Issue	05/12/2023
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Asbestos Approved By

Analysed by Asbestos Approved Analyst: Stuart Chen
 Authorised by Asbestos Approved Signatory: Stuart Chen

Results Approved By

Dragana Tomas, Senior Chemist
 Hannah Nguyen, Metals Supervisor
 Steven Luong, Senior Chemist
 Stuart Chen, Analyst/Reporting coordinator
 Tim Toll, Chemist (FAS)

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil

Our Reference		338808-1	338808-2	338808-4	338808-5	338808-7
Your Reference	UNITS	1A/1D	1A/2D	2A/1D	2A/2D	3A/1D
Depth		0.1	0.5	0.1	0.5	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Date analysed	-	30/11/2023	30/11/2023	30/11/2023	30/11/2023	30/11/2023
TRH C ₆ - C ₉	mg/kg	<25	<25	<25	<25	<25
TRH C ₆ - C ₁₀	mg/kg	<25	<25	<25	<25	<25
vTPH C ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	102	105	82	83	100

vTRH(C6-C10)/BTEXN in Soil

Our Reference		338808-8	338808-10
Your Reference	UNITS	3A/2D	4A/1D
Depth		0.5	0.1
Date Sampled		22/11/2023	22/11/2023
Type of sample		Soil	Soil
Date extracted	-	29/11/2023	29/11/2023
Date analysed	-	30/11/2023	30/11/2023
TRH C ₆ - C ₉	mg/kg	<25	<25
TRH C ₆ - C ₁₀	mg/kg	<25	<25
vTPH C ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
Naphthalene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<1	<1
Surrogate aaa-Trifluorotoluene	%	100	78

svTRH (C10-C40) in Soil						
Our Reference		338808-1	338808-2	338808-4	338808-5	338808-7
Your Reference	UNITS	1A/1D	1A/2D	2A/1D	2A/2D	3A/1D
Depth		0.1	0.5	0.1	0.5	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Date analysed	-	30/11/2023	30/11/2023	30/11/2023	30/11/2023	30/11/2023
TRH C ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	120
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	120
TRH >C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	160
TRH >C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	160
Surrogate o-Terphenyl	%	94	93	92	93	99

svTRH (C10-C40) in Soil			
Our Reference		338808-8	338808-10
Your Reference	UNITS	3A/2D	4A/1D
Depth		0.5	0.1
Date Sampled		22/11/2023	22/11/2023
Type of sample		Soil	Soil
Date extracted	-	29/11/2023	29/11/2023
Date analysed	-	30/11/2023	30/11/2023
TRH C ₁₀ - C ₁₄	mg/kg	<50	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50
TRH >C ₁₀ -C ₁₆	mg/kg	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50
TRH >C ₁₆ -C ₃₄	mg/kg	<100	110
TRH >C ₃₄ -C ₄₀	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	110
Surrogate o-Terphenyl	%	95	93

PAHs in Soil						
Our Reference		338808-1	338808-2	338808-4	338808-5	338808-7
Your Reference	UNITS	1A/1D	1A/2D	2A/1D	2A/2D	3A/1D
Depth		0.1	0.5	0.1	0.5	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Date analysed	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate <i>p</i> -Terphenyl-d14	%	86	94	92	93	90

PAHs in Soil			
Our Reference		338808-8	338808-10
Your Reference	UNITS	3A/2D	4A/1D
Depth		0.5	0.1
Date Sampled		22/11/2023	22/11/2023
Type of sample		Soil	Soil
Date extracted	-	29/11/2023	29/11/2023
Date analysed	-	29/11/2023	29/11/2023
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Surrogate <i>p</i> -Terphenyl-d14	%	88	88

Organochlorine Pesticides in soil						
Our Reference		338808-1	338808-2	338808-4	338808-5	338808-7
Your Reference	UNITS	1A/1D	1A/2D	2A/1D	2A/2D	3A/1D
Depth		0.1	0.5	0.1	0.5	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Date analysed	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	95	91	92	94	95

Organochlorine Pesticides in soil			
Our Reference		338808-8	338808-10
Your Reference	UNITS	3A/2D	4A/1D
Depth		0.5	0.1
Date Sampled		22/11/2023	22/11/2023
Type of sample		Soil	Soil
Date extracted	-	29/11/2023	29/11/2023
Date analysed	-	29/11/2023	29/11/2023
alpha-BHC	mg/kg	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	97	98

Organophosphorus Pesticides in Soil						
Our Reference		338808-1	338808-2	338808-4	338808-5	338808-7
Your Reference	UNITS	1A/1D	1A/2D	2A/1D	2A/2D	3A/1D
Depth		0.1	0.5	0.1	0.5	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Date analysed	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	95	91	92	94	95

Organophosphorus Pesticides in Soil			
Our Reference		338808-8	338808-10
Your Reference	UNITS	3A/2D	4A/1D
Depth		0.5	0.1
Date Sampled		22/11/2023	22/11/2023
Type of sample		Soil	Soil
Date extracted	-	29/11/2023	29/11/2023
Date analysed	-	29/11/2023	29/11/2023
Dichlorvos	mg/kg	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1
Chlorpyrifos	mg/kg	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	97	98

PCBs in Soil						
Our Reference		338808-1	338808-2	338808-4	338808-5	338808-7
Your Reference	UNITS	1A/1D	1A/2D	2A/1D	2A/2D	3A/1D
Depth		0.1	0.5	0.1	0.5	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Date analysed	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	95	93	92	92	94

PCBs in Soil			
Our Reference		338808-8	338808-10
Your Reference	UNITS	3A/2D	4A/1D
Depth		0.5	0.1
Date Sampled		22/11/2023	22/11/2023
Type of sample		Soil	Soil
Date extracted	-	29/11/2023	29/11/2023
Date analysed	-	29/11/2023	29/11/2023
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	96	94

Acid Extractable metals in soil

Our Reference		338808-1	338808-2	338808-4	338808-5	338808-7
Your Reference	UNITS	1A/1D	1A/2D	2A/1D	2A/2D	3A/1D
Depth		0.1	0.5	0.1	0.5	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Date analysed	-	30/11/2023	30/11/2023	30/11/2023	30/11/2023	30/11/2023
Arsenic	mg/kg	86	29	13	27	30
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	9	7	6	8	12
Copper	mg/kg	23	20	19	22	22
Lead	mg/kg	15	16	15	27	20
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	2	2	1	2	4
Zinc	mg/kg	9	42	31	48	90

Acid Extractable metals in soil

Our Reference		338808-8	338808-10	338808-11
Your Reference	UNITS	3A/2D	4A/1D	1A/1D - [TRIPLICATE]
Depth		0.5	0.1	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	29/11/2023	29/11/2023	29/11/2023
Date analysed	-	30/11/2023	30/11/2023	30/11/2023
Arsenic	mg/kg	25	33	100
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	4	8	6
Copper	mg/kg	18	26	15
Lead	mg/kg	8	100	10
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	<1	1
Zinc	mg/kg	8	58	6

Moisture						
Our Reference		338808-1	338808-2	338808-4	338808-5	338808-7
Your Reference	UNITS	1A/1D	1A/2D	2A/1D	2A/2D	3A/1D
Depth		0.1	0.5	0.1	0.5	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Date analysed	-	30/11/2023	30/11/2023	30/11/2023	30/11/2023	30/11/2023
Moisture	%	5.6	8.7	7.0	11	15

Moisture			
Our Reference		338808-8	338808-10
Your Reference	UNITS	3A/2D	4A/1D
Depth		0.5	0.1
Date Sampled		22/11/2023	22/11/2023
Type of sample		Soil	Soil
Date prepared	-	29/11/2023	29/11/2023
Date analysed	-	30/11/2023	30/11/2023
Moisture	%	1.7	11

Asbestos ID - soils				
Our Reference		338808-3	338808-6	338808-9
Your Reference	UNITS	1A/3D	2A/3D	3A/3D
Depth		0.1	0.1	0.1
Date Sampled		22/11/2023	22/11/2023	22/11/2023
Type of sample		Soil	Soil	Soil
Date analysed	-	04/12/2023	04/12/2023	04/12/2023
Sample mass tested	g	Approx. 70g	Approx. 80g	Approx. 65g
Sample Description	-	Beige fine-grained soil & rocks	Beige fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	<p>Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.</p> <p>For soil results:-</p> <ol style="list-style-type: none"> 1. 'EQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. <p>Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.</p>
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	<p>Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.</p> <p>Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.</p>

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	338808-2
Date extracted	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Date analysed	-			30/11/2023	1	30/11/2023	30/11/2023		30/11/2023	30/11/2023
TRH C ₆ - C ₉	mg/kg	25	Org-023	<25	1	<25	<25	0	86	113
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	<25	1	<25	<25	0	86	113
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	91	118
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	86	113
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	81	108
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	87	114
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	85	115
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	98	1	102	95	7	86	106

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	338808-2
Date extracted	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Date analysed	-			30/11/2023	1	30/11/2023	30/11/2023		30/11/2023	30/11/2023
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	<50	1	<50	<50	0	90	116
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	<100	1	<100	<100	0	107	121
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	<100	1	<100	<100	0	100	113
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	<50	1	<50	<50	0	90	116
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	<100	1	<100	<100	0	107	121
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	<100	1	<100	<100	0	100	113
Surrogate o-Terphenyl	%		Org-020	95	1	94	94	0	108	99

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	338808-2
Date extracted	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Date analysed	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	109	95
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	111	95
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	120	105
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	94
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	110	97
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	117	95
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	97	83
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	<0.05	<0.05	0	118	93
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	91	1	86	94	9	96	86

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	338808-2
Date extracted	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Date analysed	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	84
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	78	72
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	99	99
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	122	107
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	114	104
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	127	113
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	135	126
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	68	61
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	86	76
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	122	124
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	98	1	95	97	2	102	94

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	338808-2
Date extracted	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Date analysed	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	123	89
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	93	79
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	111	91
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	81	69
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	92
Fenthion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	115	95
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	88
Phosalone	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	98	1	95	97	2	102	94

QUALITY CONTROL: PCBs in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	338808-2
Date extracted	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Date analysed	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Aroclor 1016	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	135	100
Aroclor 1260	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	93	1	95	95	0	95	86

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	338808-2
Date prepared	-			29/11/2023	1	29/11/2023	29/11/2023		29/11/2023	29/11/2023
Date analysed	-			30/11/2023	1	30/11/2023	30/11/2023		30/11/2023	30/11/2023
Arsenic	mg/kg	4	Metals-020	<4	1	86	60	36	106	110
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	100	90
Chromium	mg/kg	1	Metals-020	<1	1	9	6	40	108	100
Copper	mg/kg	1	Metals-020	<1	1	23	16	36	110	111
Lead	mg/kg	1	Metals-020	<1	1	15	9	50	111	99
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	108	123
Nickel	mg/kg	1	Metals-020	<1	1	2	1	67	107	99
Zinc	mg/kg	1	Metals-020	<1	1	9	6	40	100	#

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Acid Extractable Metals in Soil:

- The laboratory RPD acceptance criteria has been exceeded for 338808-1 for Pb. Therefore a triplicate result has been issued as laboratory sample number 338808-11.

- # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos according to ASB-001 asbestos subsampling procedure. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab/MPL recommends supplying 40-60g or 500ml of sample in its own container.

Note: Samples requested for asbestos testing were sub-sampled from bags provided by the client.



CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

Company:	ACT Geotechnical Engineers			Client Project Name/Number/Site etc (ie report title):	217A Beach Road, Denhams Beach, NSW		
Contact Person:	Jeremy Murray			PO No. (if applicable):			
Project Mgr:				EnviroLab Quote No. :			
Sampler:	Jeremy Murray			Date results required:	<input checked="" type="checkbox"/> Standard <input type="checkbox"/> Same Day <input type="checkbox"/> 1 day <input type="checkbox"/> 2 day <input type="checkbox"/> 3 day		
Address:	157 Newcastle St, Fyshwick, ACT, 2609			Or choose:			
Phone:	02 62852547	Mob:	0404064858	Note: Inform lab in advance if urgent turnaround is required - surcharges apply			
Email Results to:	jeremy.murray@actgeoeng.com.au			Additional report format:	<input type="checkbox"/> Esdat <input type="checkbox"/> Equis		
Email Invoice to:	admin@actgeoeng.com.au			Lab Comments:			

Sample information					Tests Required									
EnviroLab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	TRH (C6 - C36)	BTEX	PCBs	PAH	Heavy Metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)	OC/OP	Cresol (total)	Glyphosate	Asbestos presence	
1	1A/1D	0.1M	22/11/2023		X	X	X	X	X	X				
2	1A/2D	0.5M	22/11/2023		X	X	X	X	X	X				
3	1A/3D	0.1m	22/11/2023										X	
4	2A/1D	0.1M	22/11/2023		X	X	X	X	X	X				
5	2A/2D	0.5M	22/11/2023		X	X	X	X	X	X				
6	2A/3D	0.1m	22/11/2023										X	
7	3A/1D	0.1M	22/11/2023		X	X	X	X	X	X				
8	3A/2D	0.5M	22/11/2023		X	X	X	X	X	X				
9	3A/3D	0.1m	22/11/2023										X	
10	4A/1D	0.1M	22/11/2023		X	X	X	X	X	X				



Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company):	ACT Geotech	Received by (Company):	ELS
Print Name:	Jeremy Murray	Print Name:	RLG
Date & Time:	12pm, 27 November 2023	Date & Time:	28/11/23 @ 1040
Signature:		Signature:	RLG
		Job number:	33880
		Temperature:	10
		TAT Req - SAME day / 1 /	

APPENDIX D
Lotsearch Environmental Risk Report



LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Date: 20 Dec 2023 08:51:28

Reference: LS051234 EP

Address: 217a Beach Road, Denhams Beach, NSW 2536

Disclaimer:

The purpose of this report is to provide an overview of some of the site history, environmental risk and planning information available, affecting an individual address or geographical area in which the property is located. It is not a substitute for an on-site inspection or review of other available reports and records. It is not intended to be, and should not be taken to be, a rating or assessment of the desirability or market value of the property or its features. You should obtain independent advice before you make any decision based on the information within the report. The detailed terms applicable to use of this report are set out at the end of this report.

Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features On-site	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	NSW Department of Customer Service - Spatial Services	14/09/2023	14/09/2023	Quarterly	-	-	-	-
Topographic Data	NSW Department of Customer Service - Spatial Services	22/08/2022	22/08/2022	Annually	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	27/11/2023	09/11/2023	Monthly	1000m	0	0	0
Contaminated Land Records of Notice	Environment Protection Authority	27/11/2023	27/11/2023	Monthly	1000m	0	0	0
Former Gasworks	Environment Protection Authority	16/10/2023	14/07/2021	Quarterly	1000m	0	0	0
Notices under the POEO Act 1997	Environment Protection Authority	01/12/2023	01/12/2023	Monthly	1000m	0	0	0
National Waste Management Facilities Database	Geoscience Australia	26/05/2022	07/03/2017	Annually	1000m	0	0	0
National Liquid Fuel Facilities	Geoscience Australia	20/09/2023	07/09/2020	Annually	1000m	0	0	0
EPA PFAS Investigation Program	Environment Protection Authority	28/11/2023	21/11/2023	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Investigation Sites	Department of Defence	28/11/2023	28/11/2023	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	28/11/2023	28/11/2023	Monthly	2000m	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	28/11/2023	28/11/2023	Monthly	2000m	0	0	0
Defence Controlled Areas	Department of Defence	10/10/2023	10/10/2023	Quarterly	2000m	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	19/10/2023	02/09/2022	Quarterly	2000m	0	0	0
National Unexploded Ordnance (UXO)	Department of Defence	10/10/2023	10/10/2023	Quarterly	2000m	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	13/11/2023	15/12/2022	Annually	1000m	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	28/11/2023	28/11/2023	Monthly	1000m	0	0	0
Delicensed POEO Activities still regulated by the EPA	Environment Protection Authority	28/11/2023	28/11/2023	Monthly	1000m	0	0	0
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	28/11/2023	28/11/2023	Monthly	1000m	0	3	3
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	150m	0	0	0
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	150m	-	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500m	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500m	-	0	0
Points of Interest	NSW Department of Customer Service - Spatial Services	13/11/2023	13/11/2023	Quarterly	1000m	0	1	12
Tanks (Areas)	NSW Department of Customer Service - Spatial Services	13/11/2023	13/11/2023	Quarterly	1000m	0	0	0
Tanks (Points)	NSW Department of Customer Service - Spatial Services	13/11/2023	13/11/2023	Quarterly	1000m	0	0	0
Major Easements	NSW Department of Customer Service - Spatial Services	19/10/2023	19/10/2023	Quarterly	1000m	0	0	7
State Forest	Forestry Corporation of NSW	12/12/2023	11/12/2023	Annually	1000m	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	16/02/2023	31/12/2022	Annually	1000m	0	0	0
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	29/08/2022	19/08/2019	Annually	1000m	1	1	1

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features On-site	No. Features within 100m	No. Features within Buffer
Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018	NSW Department of Planning, Industry and Environment	09/05/2023	23/02/2018	Annually	1000m	0	0	0
National Groundwater Information System (NGIS) Boreholes	Bureau of Meteorology; Water NSW	18/04/2023	13/07/2022	Annually	2000m	0	0	16
NSW Seamless Geology Single Layer: Rock Units	Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	1	2	9
NSW Seamless Geology – Single Layer: Trendlines	Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	0	0	0
NSW Seamless Geology – Single Layer: Geological Boundaries and Faults	Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	0	0	0
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Annually	1000m	0	0	0
Atlas of Australian Soils	Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES)	19/05/2017	17/02/2011	Annually	1000m	1	1	1
Environmental Planning Instrument Acid Sulfate Soils	NSW Department of Planning, Industry and Environment	02/11/2023	01/09/2023	Monthly	500m	0	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	Annually	1000m	1	1	1
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	Annually	1000m	0	0	0
Mining Subsidence Districts	NSW Department of Customer Service - Subsidence Advisory NSW	16/10/2023	16/10/2023	Quarterly	1000m	0	0	0
Current Mining Titles	NSW Department of Industry	29/11/2023	29/11/2023	Monthly	1000m	0	0	0
Mining Title Applications	NSW Department of Industry	29/11/2023	29/11/2023	Monthly	1000m	0	0	0
Historic Mining Titles	NSW Department of Industry	29/11/2023	29/11/2023	Monthly	1000m	2	3	3
Environmental Planning Instrument SEPP State Significant Precincts	NSW Department of Planning, Industry and Environment	02/11/2023		Monthly	1000m	0	0	0
Environmental Planning Instrument Land Zoning	NSW Department of Planning, Industry and Environment	02/11/2023	20/10/2023	Monthly	1000m	1	3	27
Commonwealth Heritage List	Australian Government Department of the Agriculture, Water and the Environment	20/10/2023	13/04/2022	Annually	1000m	0	0	0
National Heritage List	Australian Government Department of the Agriculture, Water and the Environment	20/10/2023	13/04/2022	Annually	1000m	0	0	0
State Heritage Register - Curtilages	NSW Department of Planning, Industry and Environment	06/09/2023	03/03/2023	Quarterly	1000m	0	0	0
Environmental Planning Instrument Local Heritage	NSW Department of Planning, Industry and Environment	10/10/2023	22/09/2023	Monthly	1000m	0	0	0
Bush Fire Prone Land	NSW Rural Fire Service	27/11/2023	20/11/2023	Monthly	1000m	0	1	3
NSW Native Vegetation Type Map	NSW Department of Planning and Environment	26/05/2023	12/12/2022	Quarterly	1000m	2	2	11
Ramsar Wetlands of Australia	Australian Government Department of Agriculture, Water and the Environment	09/05/2023	01/11/2022	Annually	1000m	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	28/10/2022	26/10/2022	Annually	1000m	2	4	9
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	28/10/2022	26/10/2022	Annually	1000m	2	4	10
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	29/11/2023	29/11/2023	Weekly	10000m	-	-	-

Site Diagram

217a Beach Road, Denhams Beach, NSW 2536



Legend <div><div></div> Site Boundary</div> <div><div></div> Internal Parcel Boundaries</div>	Total Area: 1073m²		Scale: 0 10 20 Meters	
	Total Perimeter: 152m		Data Source Aerial Imagery: © Aerometrex Pty Ltd	
	<small>Disclaimers: Measurements are approximate only and may have been simplified or smaller lengths removed for readability. Parcels that make up a small percentage of the total site area have not been labelled for increased legibility.</small>		Coordinate System: GDA 1994 MGA Zone 56	Date: 20 December 2023

Contaminated Land

217a Beach Road, Denhams Beach, NSW 2536

List of NSW contaminated sites notified to EPA

Records from the NSW EPA Contaminated Land list within the dataset buffer:

Map Id	Site	Address	Suburb	Activity	Management Class	Status	Location Confidence	Dist	Direction
N/A	No records in buffer								

The values within the EPA site management class in the table above, are given more detailed explanations in the table below:

EPA site management class	Explanation
Contamination being managed via the planning process (EP&A Act)	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. The contamination of this site is managed by the consent authority under the Environmental Planning and Assessment Act 1979 (EP&A Act) planning approval process, with EPA involvement as necessary to ensure significant contamination is adequately addressed. The consent authority is typically a local council or the Department of Planning and Environment.
Contamination currently regulated under CLM Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). Management of the contamination is regulated by the EPA under the CLM Act. Regulatory notices are available on the EPA's Contaminated Land Public Record of Notices.
Contamination currently regulated under POEO Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. Management of the contamination is regulated under the Protection of the Environment Operations Act 1997 (POEO Act). The EPA's regulatory actions under the POEO Act are available on the POEO public register.
Contamination formerly regulated under the CLM Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). The contamination was addressed under the CLM Act.
Contamination formerly regulated under the POEO Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed under the Protection of the Environment Operations Act 1997 (POEO Act).
Contamination was addressed via the planning process (EP&A Act)	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed by the appropriate consent authority via the planning process under the Environmental Planning and Assessment Act 1979 (EP&A Act).
Ongoing maintenance required to manage residual contamination (CLM Act)	The EPA has determined that ongoing maintenance, under the Contaminated Land Management Act 1997 (CLM Act), is required to manage the residual contamination. Regulatory notices under the CLM Act are available on the EPA's Contaminated Land Public Record of Notices.
Regulation being finalised	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997. A regulatory approach is being finalised.
Regulation under the CLM Act not required	The EPA has completed an assessment of the contamination and decided that regulation under the Contaminated Land Management Act 1997 is not required.
Under assessment	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment. For example, the completion of management actions regulated under the planning process or Protection of the Environment Operations Act 1997. Alternatively, the EPA may require information via a notice issued under s77 of the Contaminated Land Management Act 1997 or issue a Preliminary Investigation Order.

NSW EPA Contaminated Land List Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Contaminated Land

217a Beach Road, Denhams Beach, NSW 2536

Contaminated Land: Records of Notice

Record of Notices within the dataset buffer:

Map Id	Name	Address	Suburb	Notices	Area No	Location Confidence	Distance	Direction
N/A	No records in buffer							

Contaminated Land Records of Notice Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority
Terms of use and disclaimer for Contaminated Land: Record of Notices, please visit
<http://www.epa.nsw.gov.au/clm/clmdisclaimer.htm>

Former Gasworks

Former Gasworks within the dataset buffer:

Map Id	Location	Council	Further Info	Location Confidence	Distance	Direction
N/A	No records in buffer					

Former Gasworks Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Contaminated Land

217a Beach Road, Denhams Beach, NSW 2536

EPA Notices

Penalty Notices, s.91 & s.92 Clean up Notices and s.96 Prevention Notices within the dataset buffer:

Number	Type	Name	Address	Status	Issued Date	Act	Offence	Offence Date	Loc Conf	Dist	Dir
N/A	No records in buffer										

NSW EPA Notice Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Waste Management & Liquid Fuel Facilities

217a Beach Road, Denhams Beach, NSW 2536

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Landfill	Reprocess	Transfer	Comments	Loc Conf	Dist	Direction
N/A	No records in buffer											

Waste Management Facilities Data Source: Geoscience Australia
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National Liquid Fuel Facilities

National Liquid Fuel Facilities within the dataset buffer:

Map Id	Owner	Name	Address	Suburb	Class	Operational Status	Operator	Revision Date	Loc Conf	Dist	Direction
N/A	No records in buffer										

National Liquid Fuel Facilities Data Source: Geoscience Australia
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PFAS Investigation & Management Programs

217a Beach Road, Denhams Beach, NSW 2536

EPA PFAS Investigation Program

Sites that are part of the EPA PFAS investigation program, within the dataset buffer:

Map ID	Site	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

EPA PFAS Investigation Program: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Defence PFAS Investigation Program

Sites being investigated by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Investigation Program Data Custodian: Department of Defence, Australian Government

Defence PFAS Management Program

Sites being managed by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Management Program Data Custodian: Department of Defence, Australian Government

Airservices Australia National PFAS Management Program

Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

Map ID	Site Name	Impacts	Loc Conf	Dist	Dir
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

Defence Sites and Unexploded Ordnance

217a Beach Road, Denhams Beach, NSW 2536

Defence Controlled Areas (DCA)

Defence Controlled Areas provided by the Department of Defence within the dataset buffer:

Site ID	Location Name	Loc Conf	Dist	Dir
N/A	No records in buffer			

Defence Controlled Areas, Data Custodian: Department of Defence, Australian Government

Defence 3 Year Regional Contamination Investigation Program (RCIP)

Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

Property ID	Base Name	Address	Known Contamination	Loc Conf	Dist	Dir
N/A	No records in buffer					

Defence 3 Year Regional Contamination Investigation Program, Data Custodian: Department of Defence, Australian Government

National Unexploded Ordnance (UXO)

Sites which have been assessed by the Department of Defence for the potential presence of unexploded ordnance within the dataset buffer:

Site ID	Location Name	Category	Area Description	Additional Information	Commonwealth	Loc Conf	Dist	Dir
N/A	No records in buffer							

National Unexploded Ordnance (UXO), Data Custodian: Department of Defence, Australian Government

EPA Other Sites with Contamination Issues

217a Beach Road, Denhams Beach, NSW 2536

EPA Other Sites with Contamination Issues

This dataset contains other sites identified on the EPA website as having contamination issues. This dataset currently includes:

- James Hardie asbestos manufacturing and waste disposal sites
- Radiological investigation sites in Hunter's Hill
- Pasminco Lead Abatement Strategy Area

Sites within the dataset buffer:

Site Id	Site Name	Site Address	Dataset	Comments	Location Confidence	Distance	Direction
N/A	No records in buffer						

EPA Other Sites with Contamination Issues: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

EPA Activities

217a Beach Road, Denhams Beach, NSW 2536

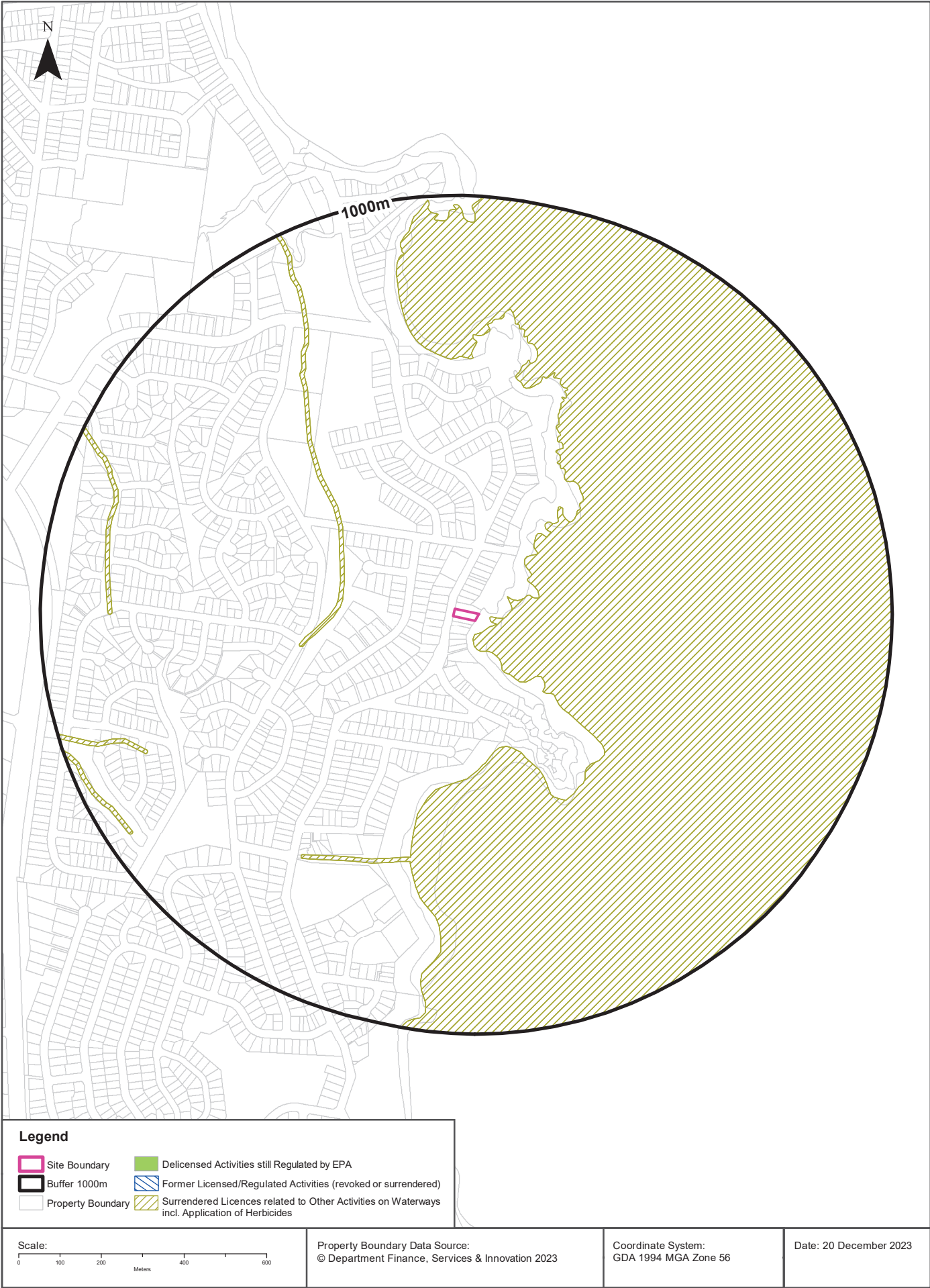
Licensed Activities under the POEO Act 1997

Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

EPL	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
N/A	No records in buffer							

POEO Licence Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority



EPA Activities

217a Beach Road, Denhams Beach, NSW 2536

Delicensed Activities still regulated by the EPA

Delicensed activities still regulated by the EPA, within the dataset buffer:

Licence No	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
N/A	No records in buffer							

Delicensed Activities Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Former Licensed Activities under the POEO Act 1997, now revoked or surrendered

Former Licensed activities under the Protection of the Environment Operations Act 1997, now revoked or surrendered, within the dataset buffer:

Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW	Surrendered	06/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	28m	East
4838	Robert Orchard	Various Waterways throughout New South Wales - SYDNEY NSW 2000	Surrendered	07/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	28m	East
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW - PROSPECT, NSW, 2148	Surrendered	09/11/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	28m	East

Former Licensed Activities Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Historical Business Directories

217a Beach Road, Denhams Beach, NSW 2536

Business Directory Records 1950-1991 Premise or Road Intersection Matches

Universal Business Directory records from years 1991, 1982, 1970, 1961 & 1950, mapped to a premise or road intersection within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
N/A	No records in buffer						

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Business Directory Records 1950-1991 Road or Area Matches

Universal Business Directory records from years 1991, 1982, 1970, 1961 & 1950, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
N/A	No records in buffer					

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

217a Beach Road, Denhams Beach, NSW 2536

Dry Cleaners, Motor Garages & Service Stations Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a premise or road intersection, within the dataset buffer.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
N/A	No records in buffer						

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Dry Cleaners, Motor Garages & Service Stations Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
N/A	No records in buffer					

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Aerial Imagery 2023

217a Beach Road, Denhams Beach, NSW 2536



<p>Scale:</p> <p>0 25 50 75 100</p> <p>Meters</p>	<p>Data Source Aerial Imagery:</p> <p>© Aerometrex Pty Ltd</p>	<p>Coordinate System:</p> <p>GDA 1994 MGA Zone 56</p>	<p>Date: 20 December 2023</p>
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Aerial Imagery 2020

217a Beach Road, Denhams Beach, NSW 2536



<p>Scale:</p> <p>0 25 50 75 100</p> <p>Meters</p>	<p>Data Source Aerial Imagery:</p> <p>© Aerometrex Pty Ltd</p>	<p>Coordinate System:</p> <p>GDA 1994 MGA Zone 56</p>	<p>Date: 20 December 2023</p>
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Aerial Imagery 2012

217a Beach Road, Denhams Beach, NSW 2536



Legend

Site Boundary

Buffer 150m

Scale: 0 25 50 75 100 Meters	Data Source Aerial Imagery: © 2023 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 56	Date: 19 December 2023
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Aerial Imagery 1997

217a Beach Road, Denhams Beach, NSW 2536



Aerial Imagery 1989

217a Beach Road, Denhams Beach, NSW 2536



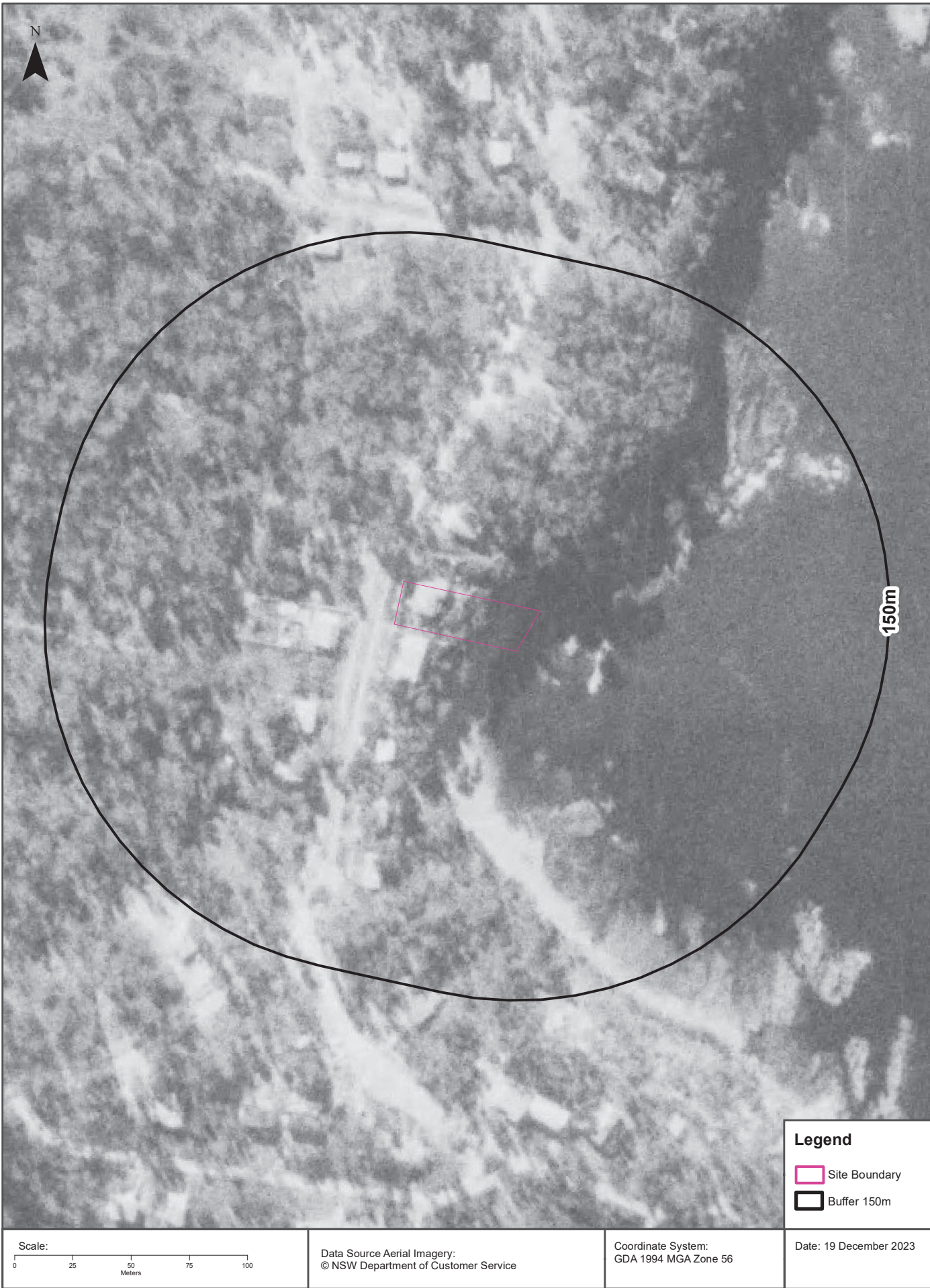
Aerial Imagery 1979

217a Beach Road, Denhams Beach, NSW 2536



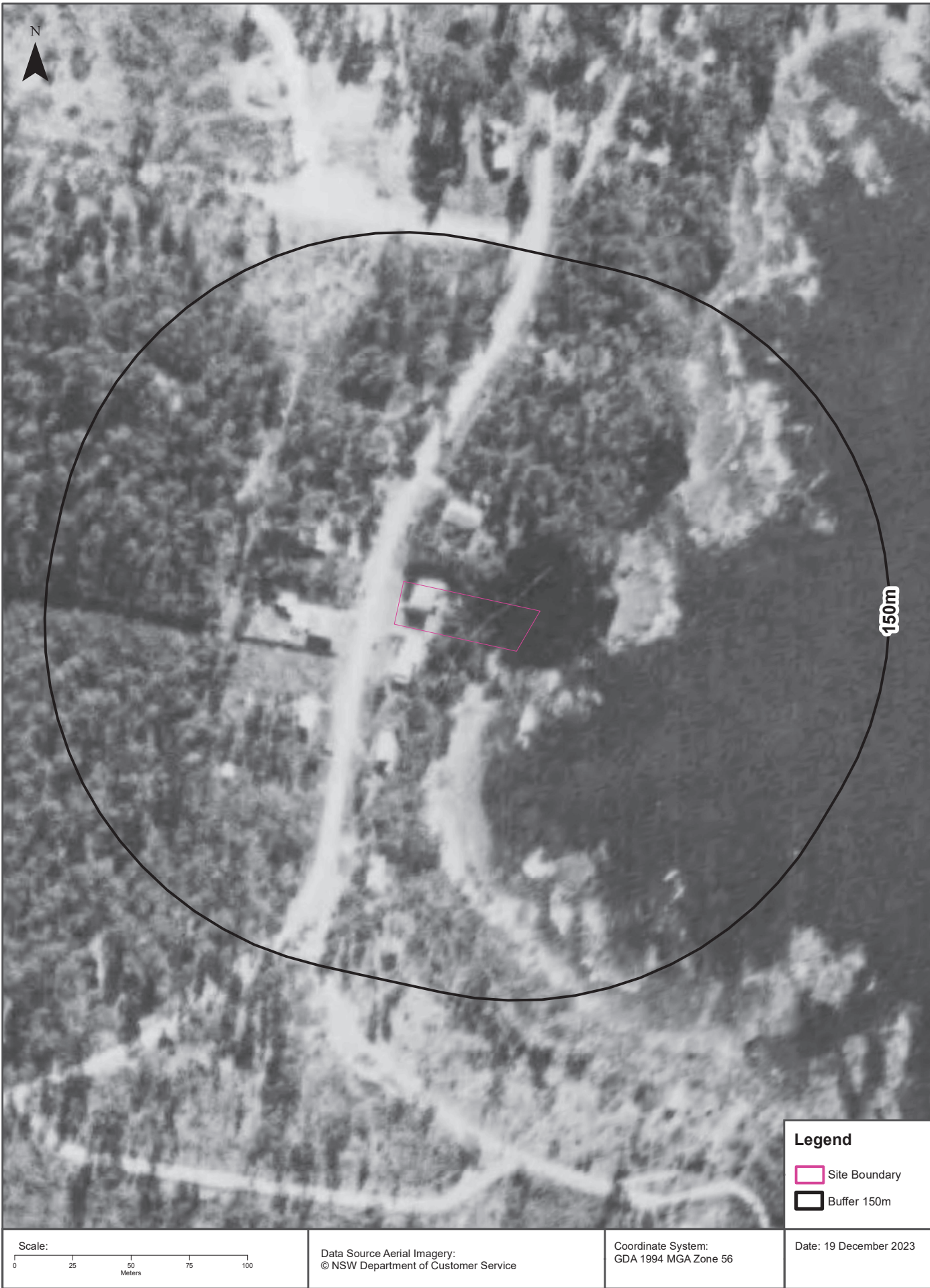
Aerial Imagery 1969

217a Beach Road, Denhams Beach, NSW 2536



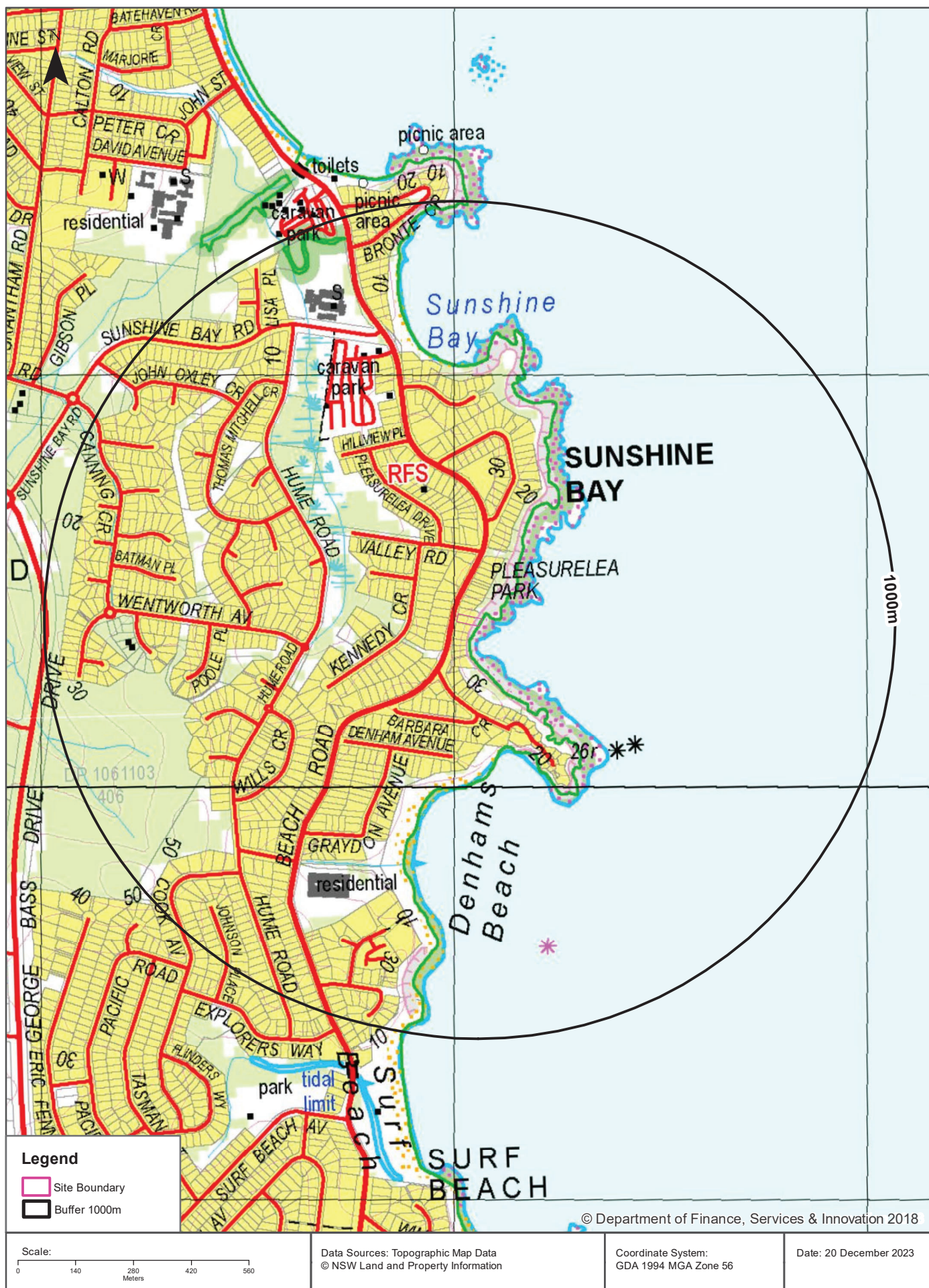
Aerial Imagery 1961

217a Beach Road, Denhams Beach, NSW 2536



Topographic Map 2015

217a Beach Road, Denhams Beach, NSW 2536



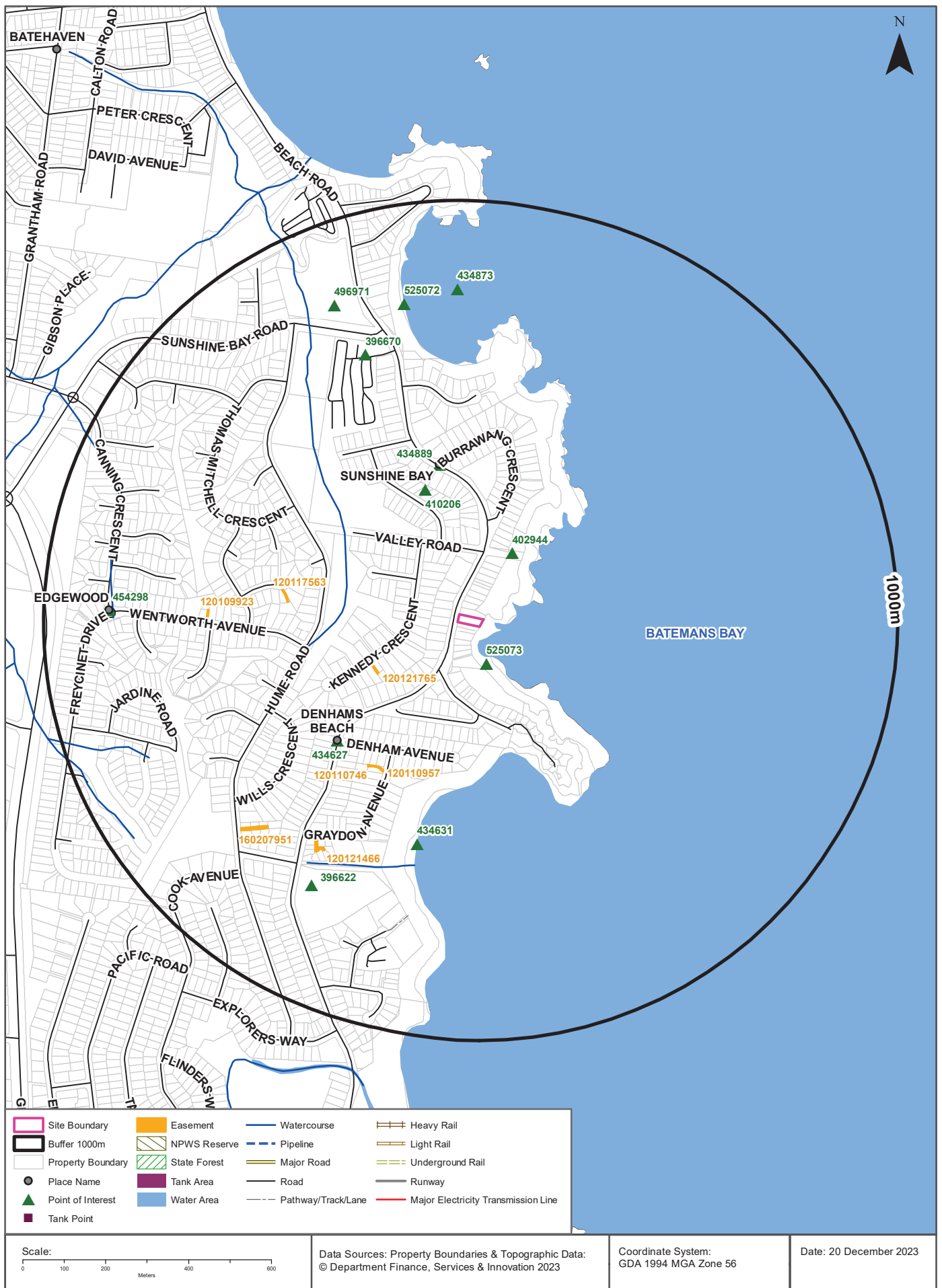
Historical Map 1971

217a Beach Road, Denhams Beach, NSW 2536



Topographic Features

217a Beach Road, Denhams Beach, NSW 2536



Topographic Features

217a Beach Road, Denhams Beach, NSW 2536

Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
525073	Beach	SUNSHINE COVE BEACH	92m	South
402944	Park	PLEASURELEA PARK	174m	North East
410206	Firestation - Bush	SURF BEACH RFB	312m	North
434889	Village	SUNSHINE BAY	365m	North
434627	Village	DENHAMS BEACH	408m	South West
434631	Beach	DENHAMS BEACH	546m	South
396670	Tourist Park / Home Village	PLEASURELEA TOURIST RESORT AND CARAVAN PARK	667m	North
396622	Nursing Home	DENHAMS BEACH CARE COMMUNITY	727m	South West
525072	Beach	SUNSHINE BAY BEACH	762m	North
434873	Bay / Inlet / Basin	SUNSHINE BAY	786m	North
496971	Primary School	SUNSHINE BAY PUBLIC SCHOOL	805m	North West
454298	Urban Place	EDGEWOOD	842m	West

Topographic Data Source: © Land and Property Information (2015)

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Topographic Features

217a Beach Road, Denhams Beach, NSW 2536

Tanks (Areas)

What are the Tank Areas located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
N/A	No records in buffer					

Tanks (Points)

What are the Tank Points located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
N/A	No records in buffer					

Tanks Data Source: © Land and Property Information (2015)

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Major Easements

What Major Easements exist within the dataset buffer?

Note. Easements provided by LPI are not at the detail of local governments. They are limited to major easements such as Right of Carriageway, Electrical Lines (66kVa etc.), Easement to drain water & Significant subterranean pipelines (gas, water etc.).

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
120121765	Primary	Undefined		227m	South West
120110957	Primary	Undefined		397m	South West
120110746	Primary	Undefined		397m	South West
120117563	Primary	Undefined		411m	West
120109923	Primary	Undefined		601m	West
120121466	Primary	Undefined		624m	South West
160207951	Primary	Right of way	6.8	672m	South West

Easements Data Source: © Land and Property Information (2015)

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Topographic Features

217a Beach Road, Denhams Beach, NSW 2536

State Forest

What State Forest exist within the dataset buffer?

State Forest Number	State Forest Name	Distance	Direction
N/A	No records in buffer		

State Forest Data Source: © NSW Department of Finance, Services & Innovation (2018)

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National Parks and Wildlife Service Reserves

What NPWS Reserves exist within the dataset buffer?

Reserve Number	Reserve Type	Reserve Name	Gazetted Date	Distance	Direction
N/A	No records in buffer				

NPWS Data Source: © NSW Department of Finance, Services & Innovation (2018)

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Hydrogeology & Groundwater

217a Beach Road, Denhams Beach, NSW 2536

Hydrogeology

Description of aquifers within the dataset buffer:

Description	Distance	Direction
Fractured or fissured, extensive aquifers of low to moderate productivity	0m	On-site

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)

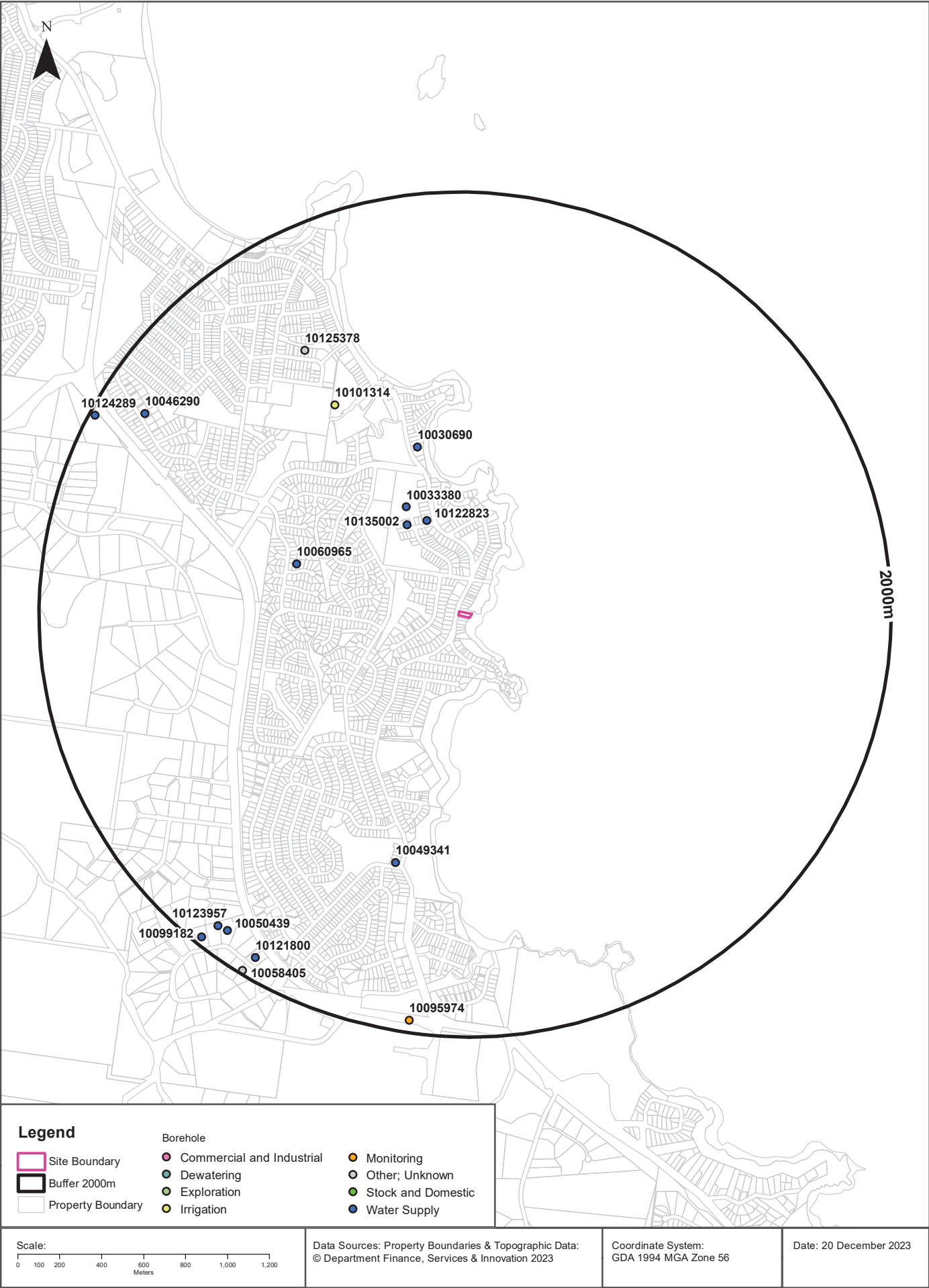
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018

Temporary water restrictions relating to the Botany Sands aquifer within the dataset buffer:

Prohibition Area No.	Prohibition	Distance	Direction
N/A	No records in buffer		

Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018 Data Source : NSW Department of Primary Industries



Hydrogeology & Groundwater

217a Beach Road, Denhams Beach, NSW 2536

Groundwater Boreholes

Boreholes within the dataset buffer:

NGIS Bore ID	NSW Bore ID	Bore Type	Status	Drill Date	Bore Depth (m)	Reference Elevation	Height Datum	Salinity (mg/L)	Yield (L/s)	SWL (mbgl)	Distance	Direction
10122823	GW105996	Water Supply	Functioning	27/05/2005	38.00		AHD	1000	0.250	13.50	458m	North
10135002	GW105984	Water Supply	Functioning	24/10/2003	30.50		AHD	900	0.600	4.50	482m	North West
10033380	GW103858	Water Supply	Unknown	30/09/1998	21.00		AHD	1500	1.100	7.00	558m	North West
10060965	GW109088	Water Supply	Unknown	22/07/2008	28.00		AHD		0.500	26.00	806m	West
10030690	GW103862	Water Supply	Unknown	30/09/1998	36.00		AHD	1500	0.600	12.00	809m	North
10101314	GW011763	Irrigation	Unknown	01/11/1955	3.70		AHD	Good			1149m	North West
10049341	GW061658	Water Supply	Unknown	01/12/1982	18.30		AHD	Salty			1217m	South
10125378	GW107487	Unknown	Unknown	08/09/2006			AHD				1446m	North West
10046290	GW107673	Water Supply	Functioning	11/11/2004	37.00		AHD	700	0.400	12.00	1770m	North West
10050439	GW100169	Water Supply	Unknown	09/12/1991	18.00		AHD	Good			1865m	South West
10123957	GW100140	Water Supply	Functioning	28/03/1991	30.00		AHD	S.Salty	0.380	13.00	1873m	South West
10121800	GW106131	Water Supply	Functioning	03/10/2003	22.00		AHD	600	2.500	2.00	1898m	South West
10095974	GW110776	Monitoring	Unknown	21/04/2010	7.00		AHD			2.90	1942m	South
10099182	GW103025	Water Supply	Unknown	01/05/1994	21.00		AHD		1.500		1963m	South West
10124289	GW110801	Water Supply	Unknown	26/02/2010	40.00		AHD			13.00	1972m	North West
10058405	GW105924	Unknown	Unknown	16/05/2005			AHD				1982m	South West

Borehole Data Source: Bureau of Meteorology; Water NSW. Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Hydrogeology & Groundwater

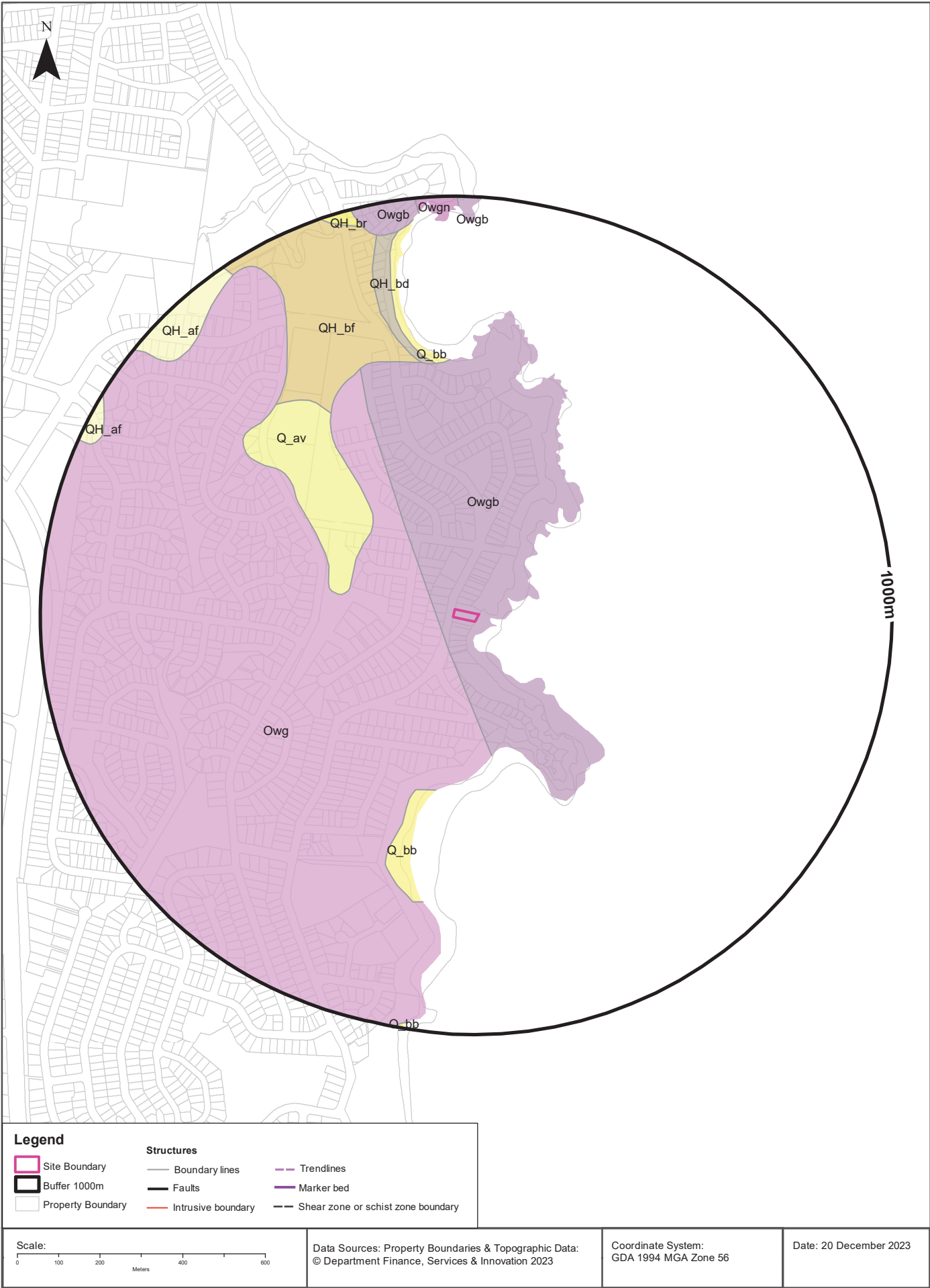
217a Beach Road, Denhams Beach, NSW 2536

Driller's Logs

Drill log data relevant to the boreholes within the dataset buffer:

NGIS Bore ID	Drillers Log	Distance	Direction
10122823	0.00m-5.00m topsoil, clay 5.00m-21.00m phyllite 21.00m-38.00m basalt black slates & minor ash layers	458m	North
10135002	0.00m-5.50m topsoil, clay 5.50m-30.50m pyrite & grey slates	482m	North West
10033380	0.00m-5.00m TOPSOIL,CLAY AND WEATHERED PHYLITE 5.00m-12.00m WEATHERED PHYLITE 12.00m-21.00m BASALT AND MINOR QUARTZ	558m	North West
10030690	0.00m-2.50m TOPSOIL,CLAY AND WEATHERED PHYLITE 2.50m-15.00m PHYLITE 15.00m-18.00m FRACTURED PHYLITE 18.00m-21.00m BLACK SLATE FRACTURED 21.00m-24.00m BLACK SLATE AND BASALT 24.00m-36.00m BASALT	809m	North
10101314	0.00m-0.61m Driller 0.61m-3.67m Sand Water Supply	1149m	North West
10049341	0.00m-0.30m Topsoil 0.30m-13.70m Clay 13.70m-18.30m Conglomerate Water Supply	1217m	South
10046290	0.00m-1.50m topsoil and clay 1.50m-8.00m shale, weathered 8.00m-12.00m shale 12.00m-37.00m basalt	1770m	North West
10123957	0.00m-8.00m SOILS & CLAYS 8.00m-20.00m SHALES 20.00m-30.00m COAL	1873m	South West
10121800	0.00m-15.00m topsoil, clam in broken basalt 15.00m-22.00m basalt and minor quartz layers	1898m	South West
10095974	0.00m-0.50m FILL 0.50m-2.90m ALLUVIUM 2.90m-7.00m RESIDUAL SOIL	1942m	South
10124289	0.00m-1.00m TOPSOIL 1.00m-3.00m CLAY 3.00m-24.00m SHALE SOFT 24.00m-40.00m SHALE HARD GREY	1972m	North West

Drill Log Data Source: Bureau of Meteorology; Water NSW. Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>



Geology

217a Beach Road, Denhams Beach, NSW 2536

Geological Units

What are the Geological Units within the dataset buffer?

Unit Code	Unit Name	Description	Unit Stratigraphy	Age	Dominant Lithology	Distance
Owgb	Bogolo Formation	Mudstone plus minor quartz sandstone and chert; mafic volcanic rocks.	\Wagonga Group\Bogolo Formation\\	Bo2 (Bolindian) (base) to Bo5 (Bolindian) (top)	Mudstone	0m
Owg	Wagonga Group	Chert, conglomerate, siltstone, sandstone, basic volcanic rocks.	\Wagonga Group\\	Iverian (base) to Bo5 (Bolindian) (top)	Chert	37m
Q_av	Alluvial valley deposits	Silt, clay, (fluvially deposited) lithic to quartz-lithic sand, gravel.	\Alluvium\Alluvial valley deposits\\	Quaternary (base) to Now (top)	Clastic sediment	259m
Q_bb	Coastal deposits - beach facies	Marine-deposited quartz-lithic fine- to medium-grained sand, shell and shell material, polymictic gravel.	\Coastal deposits\Coastal deposits - beach facies\\	Quaternary (base) to Now (top)	Sand	419m
QH_bf	Coastal deposits - backbarrier flat facies	Fine- to medium-grained quartz-lithic sand with carbonate and humic components (marine-deposited), indurated sand, silt, clay, gravel, organic mud, peat.	\Coastal deposits\Coastal deposits - backbarrier flat facies\\	Holocene (base) to Now (top)	Sand	562m
QH_bd	Coastal deposits - dune facies	Marine-deposited and aeolian-reworked coastal sand dunes.	\Coastal deposits\Coastal deposits - dune facies\\	Holocene (base) to Now (top)	Sand	597m
QH_af	Alluvial floodplain deposits	Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.	\Alluvium\Alluvial floodplain deposits\\	Holocene (base) to Now (top)	Clastic sediment	900m
Owgn	Narooma Chert	Chert and fine-grained sedimentary rocks.	\Wagonga Group\Narooma Chert\\	Iverian (base) to Bo2 (Bolindian) (top)	Chert	939m
QH_br	Coastal deposits - beach ridge	Fine- to coarse-grained quartz-lithic-carbonate sand (marine-deposited), shell and shell-fragment-rich beds, polymictic gravel.	\Coastal deposits\Coastal deposits - beach ridge\\	Holocene (base) to Now (top)	Sand	953m

Linear Geological Structures

What are the Dyke, Sill, Fracture, Lineament and Vein trendlines within the dataset buffer?

Map ID	Feature Description	Map Sheet Name	Distance
No Features			

What are the Faults, Shear zones or Schist zones, Intrusive boundaries & Marker beds within the dataset buffer?

Map ID	Boundary Type	Description	Map Sheet Name	Distance
No Features				

Geological Data Source: Statewide Seamless Geology v2.1, Department of Regional NSW

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Naturally Occurring Asbestos Potential

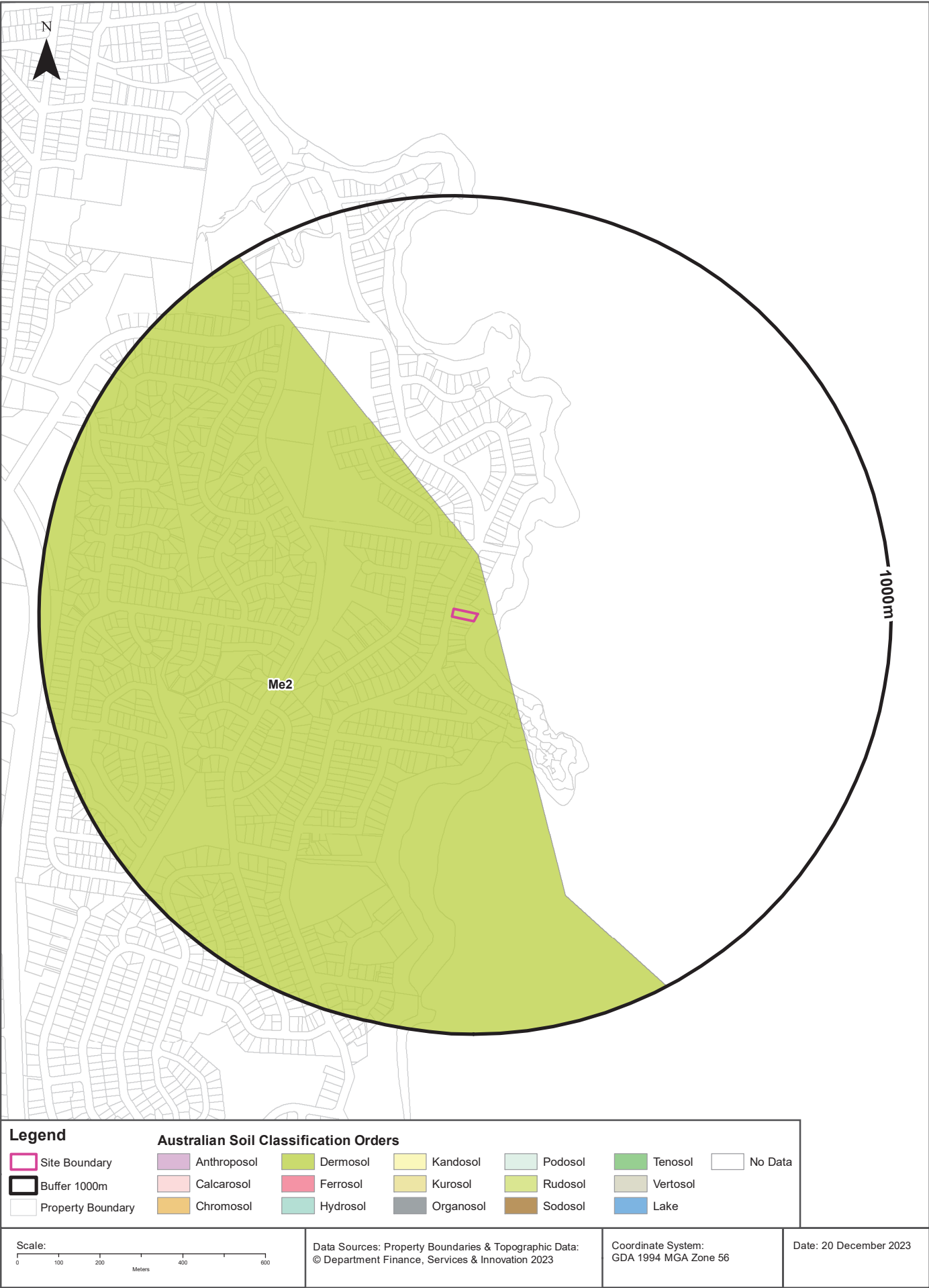
217a Beach Road, Denhams Beach, NSW 2536

Naturally Occurring Asbestos Potential

Naturally Occurring Asbestos Potential within the dataset buffer:

Potential	Sym	Strat Name	Group	Formation	Scale	Min Age	Max Age	Rock Type	Dom Lith	Description	Dist	Dir
No records in buffer												

Naturally Occurring Asbestos Potential Data Source: © State of New South Wales through NSW Department of Industry, Resources & Energy



Soils

217a Beach Road, Denhams Beach, NSW 2536

Atlas of Australian Soils

Soil mapping units and Australian Soil Classification orders within the dataset buffer:

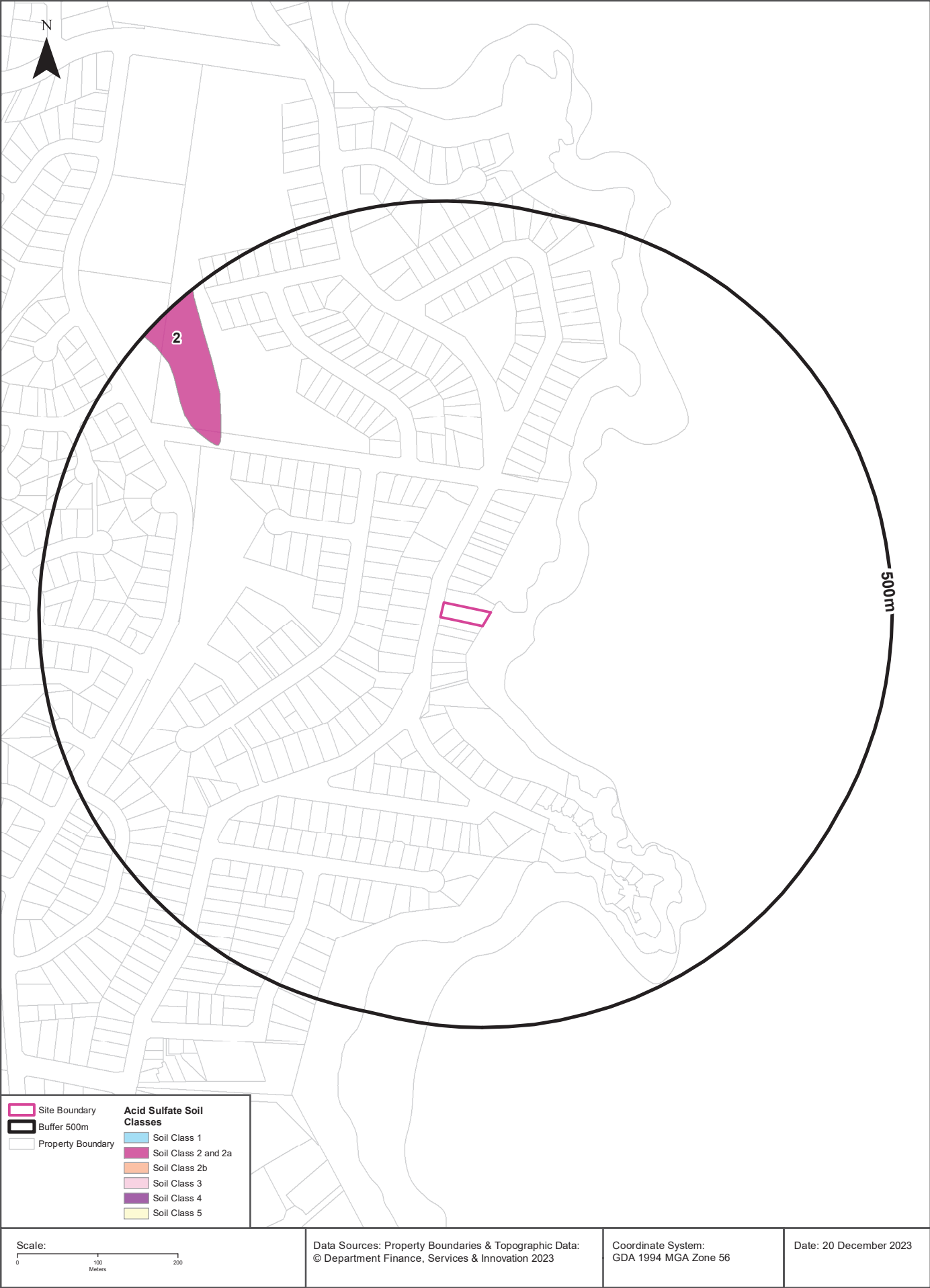
Map Unit Code	Soil Order	Map Unit Description	Distance	Direction
Me2	Dermosol	Steep hilly to mountainous with incised stream valleys: steep but more or less rounded hill slopes of brown friable earths (Gn3.21 and Gn3.22) and possibly some (Gn4) soils, in association with: at the higher altitudes, steep hill slopes of sandy soils (Uc4.2), loamy soils having an A2 horizon (Um4.2) with yellow-brown earths (Gn2.44), and possibly (Uc6.11) and (Um5.41) soils; and at the lower altitudes, moderate to steep slopes of hard acidic yellow mottled soils (Dy3.21 and Dy3.41), hard acidic red soils (Dr2.21), and yellow leached friable earths (Gn3.54); and narrow incised stream valleys of various soils including (Um6.11) and (Dy) soils. This unit is a broad one. In some areas the (Um4.2) and (Gn2.44) soils and in others the (Dy) and (Dr) soils rather than the (Gn3) soils could be dominant.	0m	On-site

Atlas of Australian Soils Data Source: CSIRO

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Acid Sulfate Soils

217a Beach Road, Denhams Beach, NSW 2536



Acid Sulfate Soils

217a Beach Road, Denhams Beach, NSW 2536

Environmental Planning Instrument - Acid Sulfate Soils

What is the on-site Acid Sulfate Soil Plan Class that presents the largest environmental risk?

Soil Class	Description	EPI Name
N/A		

If the on-site Soil Class is 5, what other soil classes exist within 500m?

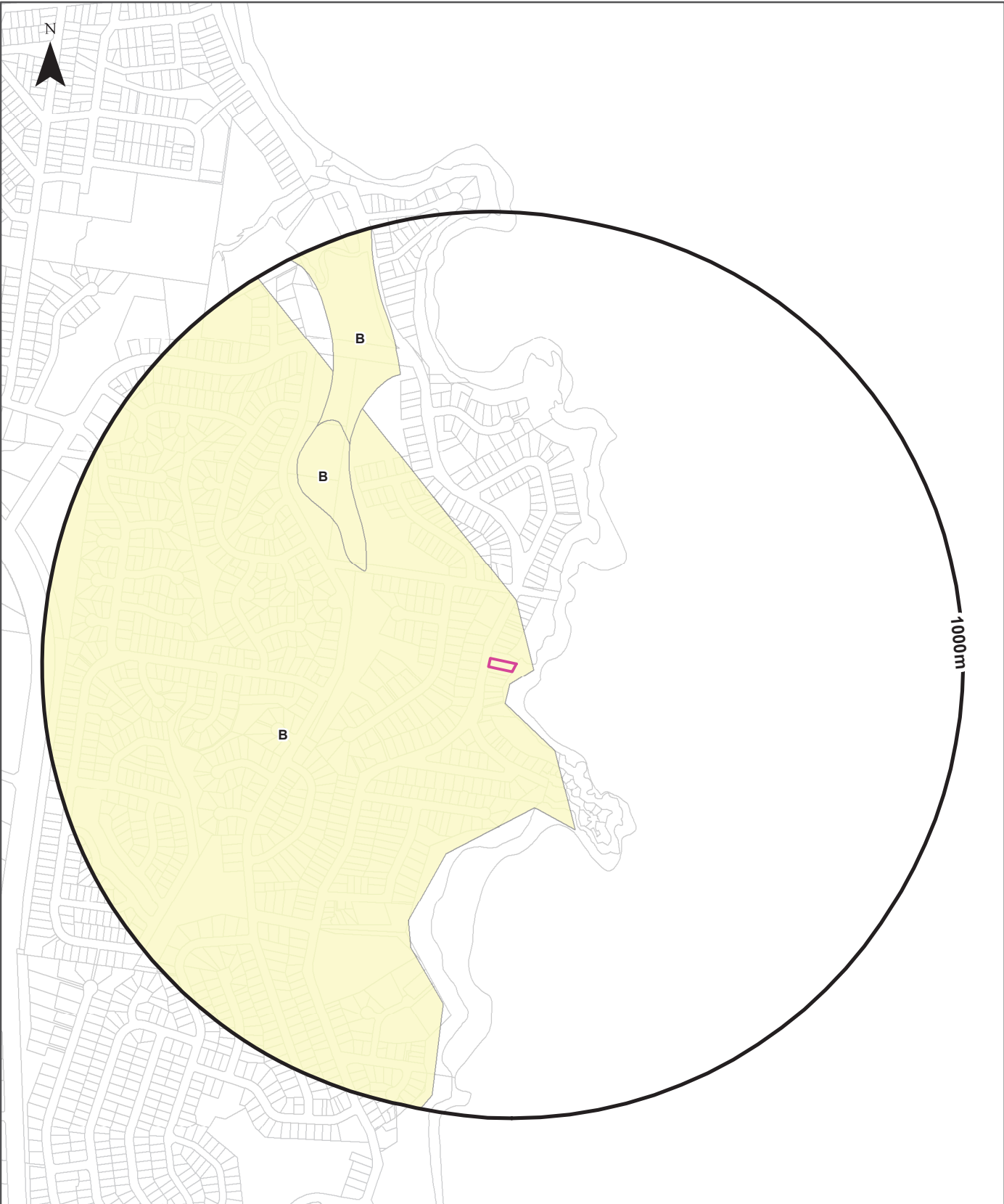
Soil Class	Description	EPI Name	Distance	Direction
N/A				









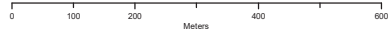
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Atlas of Australian Acid Sulfate Soils

217a Beach Road, Denhams Beach, NSW 2536



Legend			
 Site Boundary	Probability of occurrence of Acid Sulfate Soils		
 Buffer 1000m	 A. High (>70%)	 C. Extremely Low (1-5%)	 No Data
 Property Boundary	 B. Low (6-70%)	 D. No Chance (0%)	
Scale:  0 100 200 400 600 Meters		Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2023	Coordinate System: GDA 1994 MGA Zone 56
			Date: 20December 2023

Acid Sulfate Soils

217a Beach Road, Denhams Beach, NSW 2536

Atlas of Australian Acid Sulfate Soils

Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance	Direction
B	Low Probability of occurrence. 6-70% chance of occurrence.	0m	On-site

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO

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Dryland Salinity

217a Beach Road, Denhams Beach, NSW 2536

Dryland Salinity - National Assessment

Is there Dryland Salinity - National Assessment data onsite?

No

Is there Dryland Salinity - National Assessment data within the dataset buffer?

No

What Dryland Salinity assessments are given?

Assessment 2000	Assessment 2020	Assessment 2050	Distance	Direction
N/A	N/A	N/A		

Dryland Salinity Data Source : National Land and Water Resources Audit

The Commonwealth and all suppliers of source data used to derive the maps of "Australia, Forecast Areas Containing Land of High Hazard or Risk of Dryland Salinity from 2000 to 2050" do not warrant the accuracy or completeness of information in this product. Any person using or relying upon such information does so on the basis that the Commonwealth and data suppliers shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.

Any persons using this information do so at their own risk.

In many cases where a high risk is indicated, less than 100% of the area will have a high hazard or risk.

Mining

217a Beach Road, Denhams Beach, NSW 2536

Mining Subsidence Districts

Mining Subsidence Districts within the dataset buffer:

District	Distance	Direction
There are no Mining Subsidence Districts within the report buffer		

Mining Subsidence District Data Source: © Land and Property Information (2016)
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Mining

217a Beach Road, Denhams Beach, NSW 2536

Current Mining & Exploration Titles

Current Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Grant Date	Expiry Date	Last Renewed	Operation	Resource	Minerals	Dist	Dir
N/A	No records in buffer								

Current Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

Current Mining & Exploration Title Applications

Current Mining & Exploration Title Applications within the dataset buffer:

Application Ref	Applicant	Application Date	Operation	Resource	Minerals	Dist	Dir
N/A	No records in buffer						

Current Mining & Exploration Title Applications Data Source: © State of New South Wales through NSW Department of Industry

Mining

217a Beach Road, Denhams Beach, NSW 2536

Historical Mining & Exploration Titles

Historical Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Start Date	End Date	Resource	Minerals	Dist	Dir
EL2369	VALLEY EXPLORATION PTY LIMITED	19830601	19870101	MINERALS	Au	0m	On-site
PEL0059	L H SMART OIL EXPLORATION CO. LTD			PETROLEUM	Petroleum	0m	On-site
PEP0001	MAGELLAN AND SOUTHERN PACIFIC PETROLEUM N.L.			PETROLEUM	Petroleum	100m	East

Historical Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

State Environmental Planning Policy

217a Beach Road, Denhams Beach, NSW 2536

State Significant Precincts

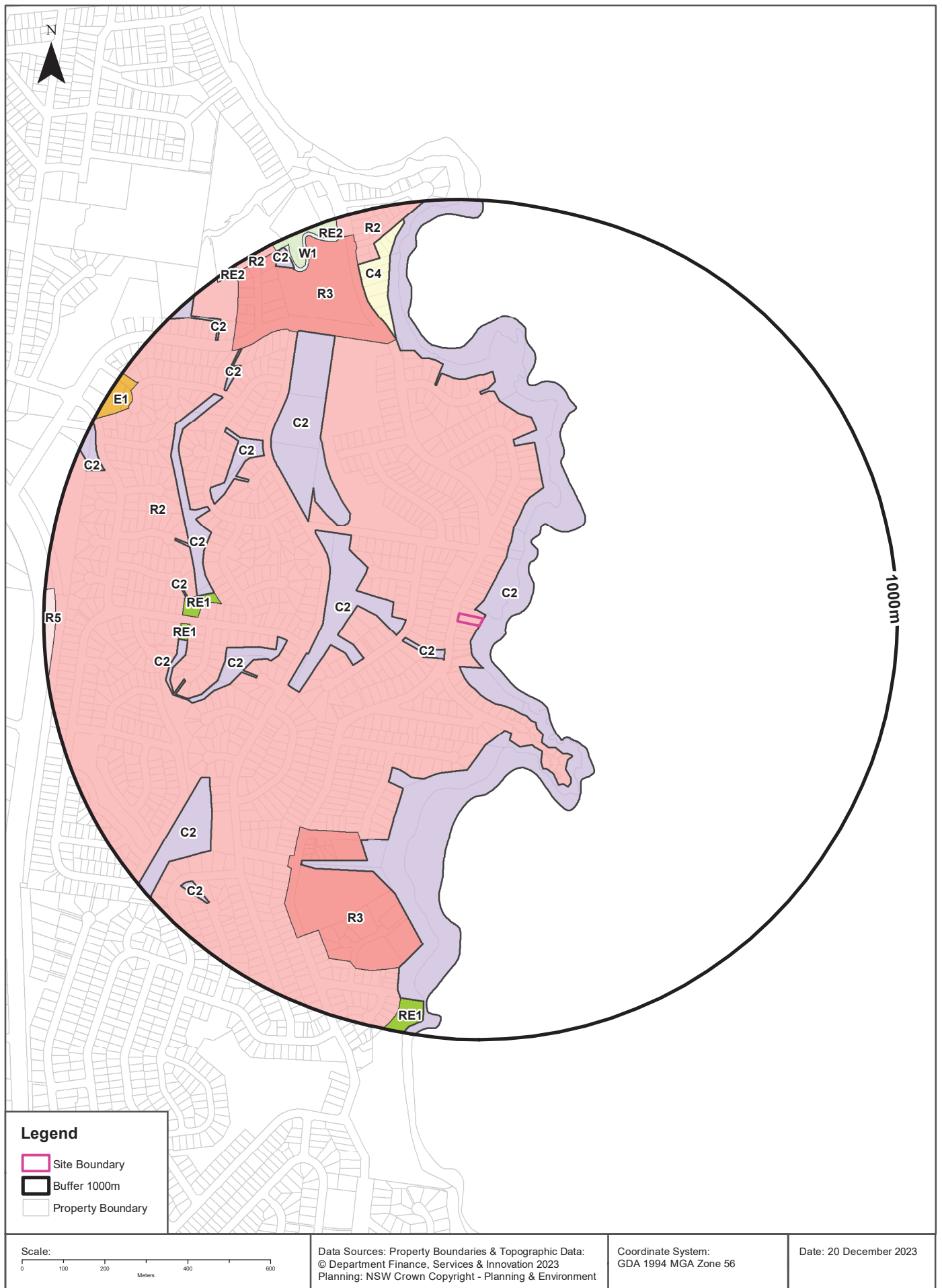
What SEPP State Significant Precincts exist within the dataset buffer?

Map Id	Precinct	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
N/A	No records in buffer							

State Environment Planning Policy Data Source: NSW Crown Copyright - Planning & Environment
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EPI Planning Zones

217a Beach Road, Denhams Beach, NSW 2536



Environmental Planning Instrument

217a Beach Road, Denhams Beach, NSW 2536

Land Zoning

What EPI Land Zones exist within the dataset buffer?

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
R2	Low Density Residential		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	0m	On-site
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	0m	South
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	74m	South West
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	125m	West
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	346m	North West
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	414m	West
R3	Medium Density Residential		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	563m	South West
RE1	Public Recreation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	571m	West
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	592m	North West

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	601m	North West
RE1	Public Recreation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	646m	West
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	653m	West
R3	Medium Density Residential		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	674m	North West
C4	Environmental Living		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	679m	North
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	707m	West
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	708m	South West
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	779m	North West
R2	Low Density Residential		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	878m	North
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	880m	North West
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	897m	South West

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
W1	Natural Waterways		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	909m	North West
RE1	Public Recreation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	916m	South
RE2	Private Recreation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	918m	North West
C2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	922m	North West
E1	Local Centre		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	940m	North West
R5	Large Lot Residential		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	970m	West
R2	Low Density Residential		Eurobodalla Local Environmental Plan 2012	24/02/2023	26/04/2023	26/04/2023	State Environmental Planning Policy Amendment (Land Use Zones) 2023	980m	North West

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Heritage

217a Beach Road, Denhams Beach, NSW 2536

Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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National Heritage List

What are the National Heritage List Items located within the dataset buffer?

Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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State Heritage Register - Curtilages

What are the State Heritage Register Items located within the dataset buffer?

Map Id	Name	Address	LGA	Listing Date	Listing No	Plan No	Distance	Direction
N/A	No records in buffer							

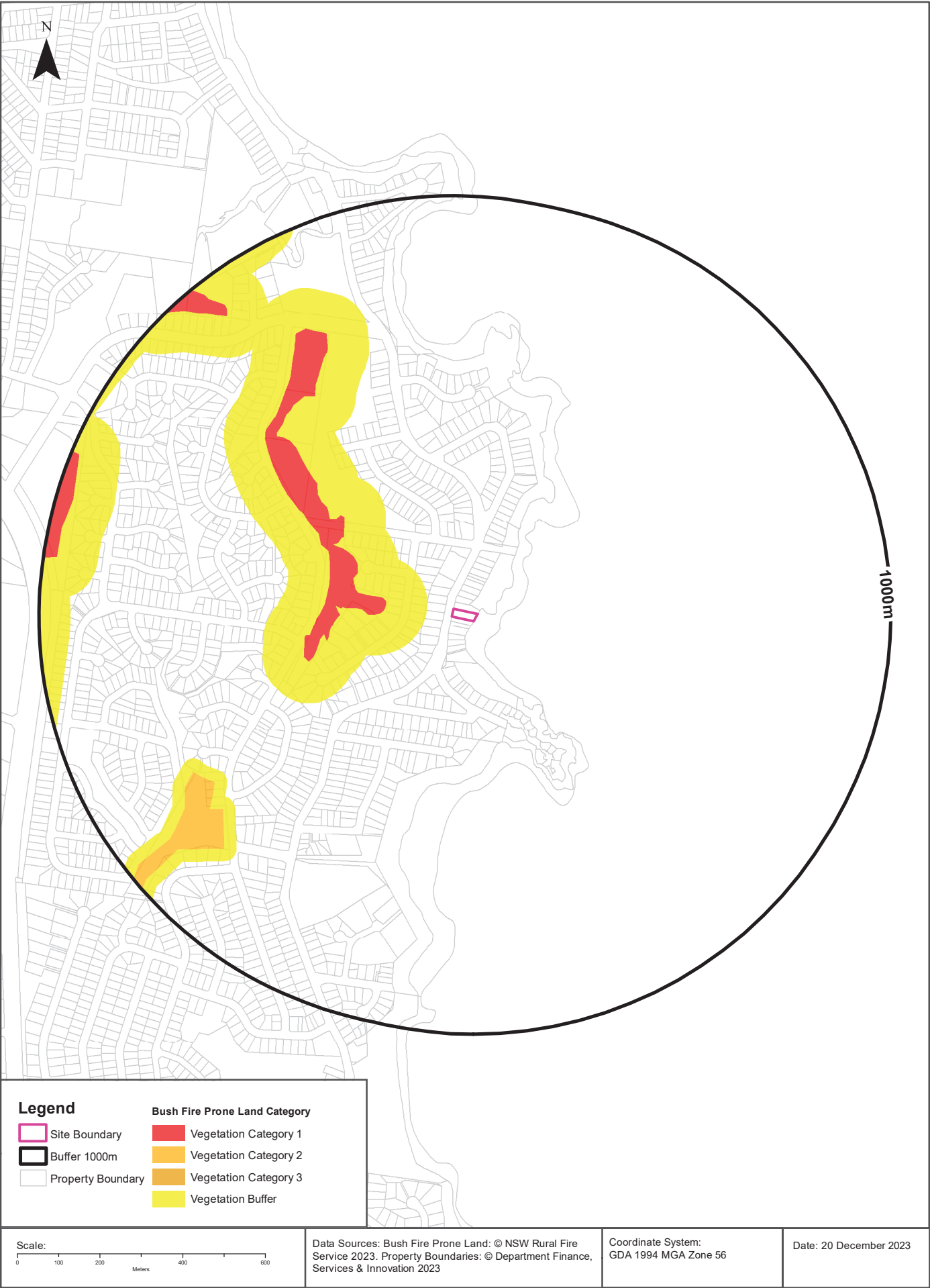
Heritage Data Source: NSW Crown Copyright - Office of Environment & Heritage
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Environmental Planning Instrument - Heritage

What are the EPI Heritage Items located within the dataset buffer?

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
N/A	No records in buffer								

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Natural Hazards

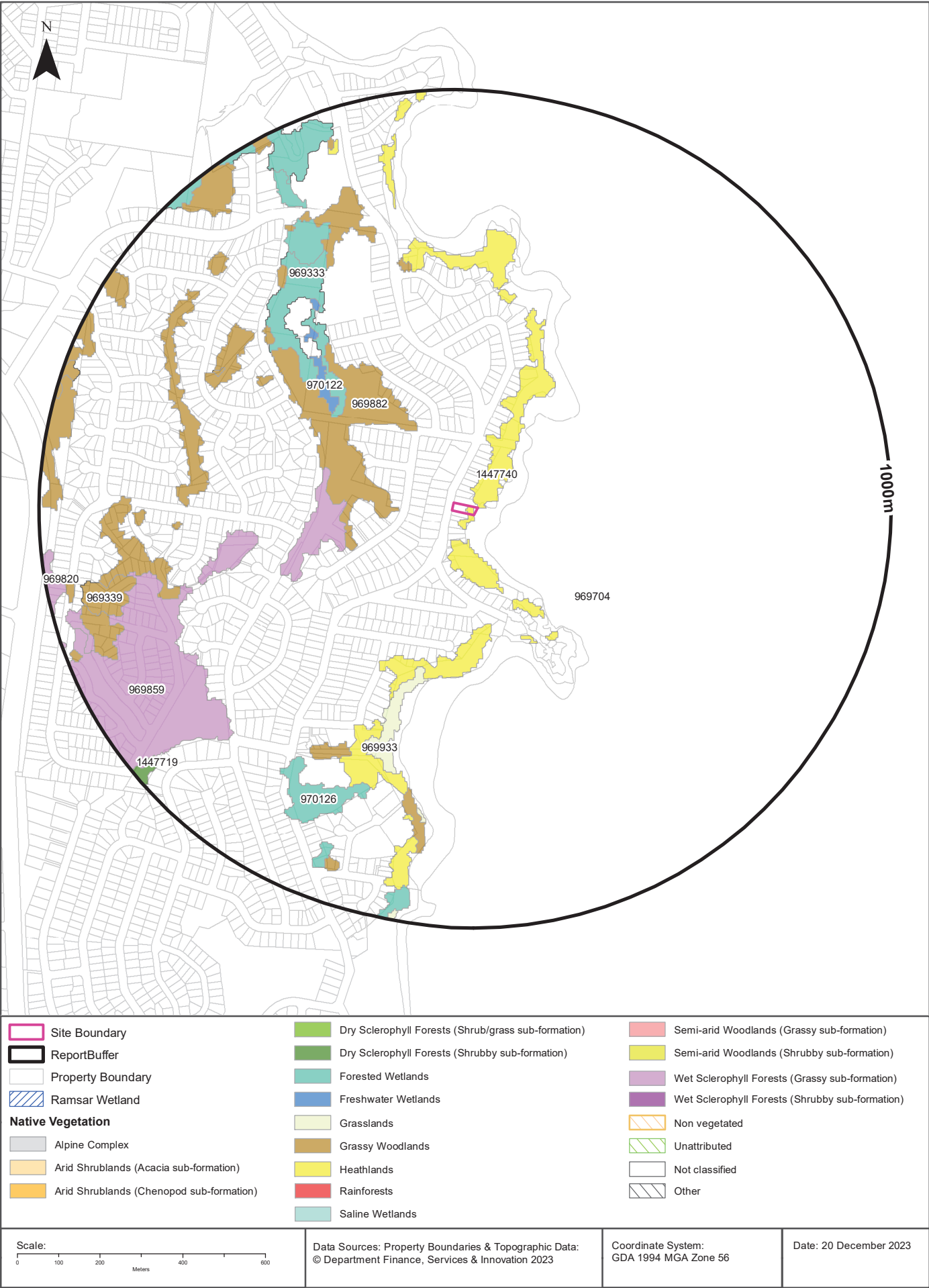
217a Beach Road, Denhams Beach, NSW 2536

Bush Fire Prone Land

What are the nearest Bush Fire Prone Land Categories that exist within the dataset buffer?

Bush Fire Prone Land Category	Distance	Direction
Vegetation Buffer	62m	North West
Vegetation Category 1	162m	North West
Vegetation Category 2	699m	South West

NSW Bush Fire Prone Land - © NSW Rural Fire Service under Creative Commons 4.0 International Licence



Ecological Constraints

217a Beach Road, Denhams Beach, NSW 2536

Native Vegetation

What native vegetation exists within the dataset buffer?

Map ID	Vegetation Formation	Plant Community Type and Vegetation Formation	Vegetation Class	Dist	Dir
969704	Not classified	(Not classified) Not classified	Not classified	0m	On-site
1447740	Heathlands	(Heathlands) Coastal Foredune Wattle Scrub	Coastal Headland Heaths	0m	On-site
969882	Grassy Woodlands	(Grassy Woodlands) South Coast Lowland Woollybutt Grassy Forest	Coastal Valley Grassy Woodlands	128m	North West
969859	Wet Sclerophyll Forests (Grassy sub-formation)	(Wet Sclerophyll Forests (Grassy sub-formation)) South Coast Spotted Gum Cycad Dry Forest	Southern Lowland Wet Sclerophyll Forests	254m	South West
969333	Forested Wetlands	(Forested Wetlands) South Coast Floodplain Grassy Swamp Forest	Coastal Floodplain Wetlands	344m	North West
970122	Freshwater Wetlands	(Freshwater Wetlands) Southern Lower Floodplain Freshwater Wetland	Coastal Freshwater Lagoons	363m	North West
969933	Grasslands	(Grasslands) Spinifex Strandline Grassland	Maritime Grasslands	384m	South
969339	Grassy Woodlands	(Grassy Woodlands) South Coast Low Hills Red Gum Grassy Forest	Coastal Valley Grassy Woodlands	639m	West
970126	Forested Wetlands	(Forested Wetlands) Shoalhaven Lowland Flats Wet Swamp Forest	Coastal Swamp Forests	671m	South West
969820	Wet Sclerophyll Forests (Grassy sub-formation)	(Wet Sclerophyll Forests (Grassy sub-formation)) South Coast Lowland Shrub-Grass Forest	Southern Lowland Wet Sclerophyll Forests	919m	West
1447719	Dry Sclerophyll Forests (Shrubby sub-formation)	(Dry Sclerophyll Forests (Shrubby sub-formation)) South Coast Lowland Blackbutt Forest	South East Dry Sclerophyll Forests	930m	South West

Native Vegetation Type Map : NSW Department of Planning and Environment 2022

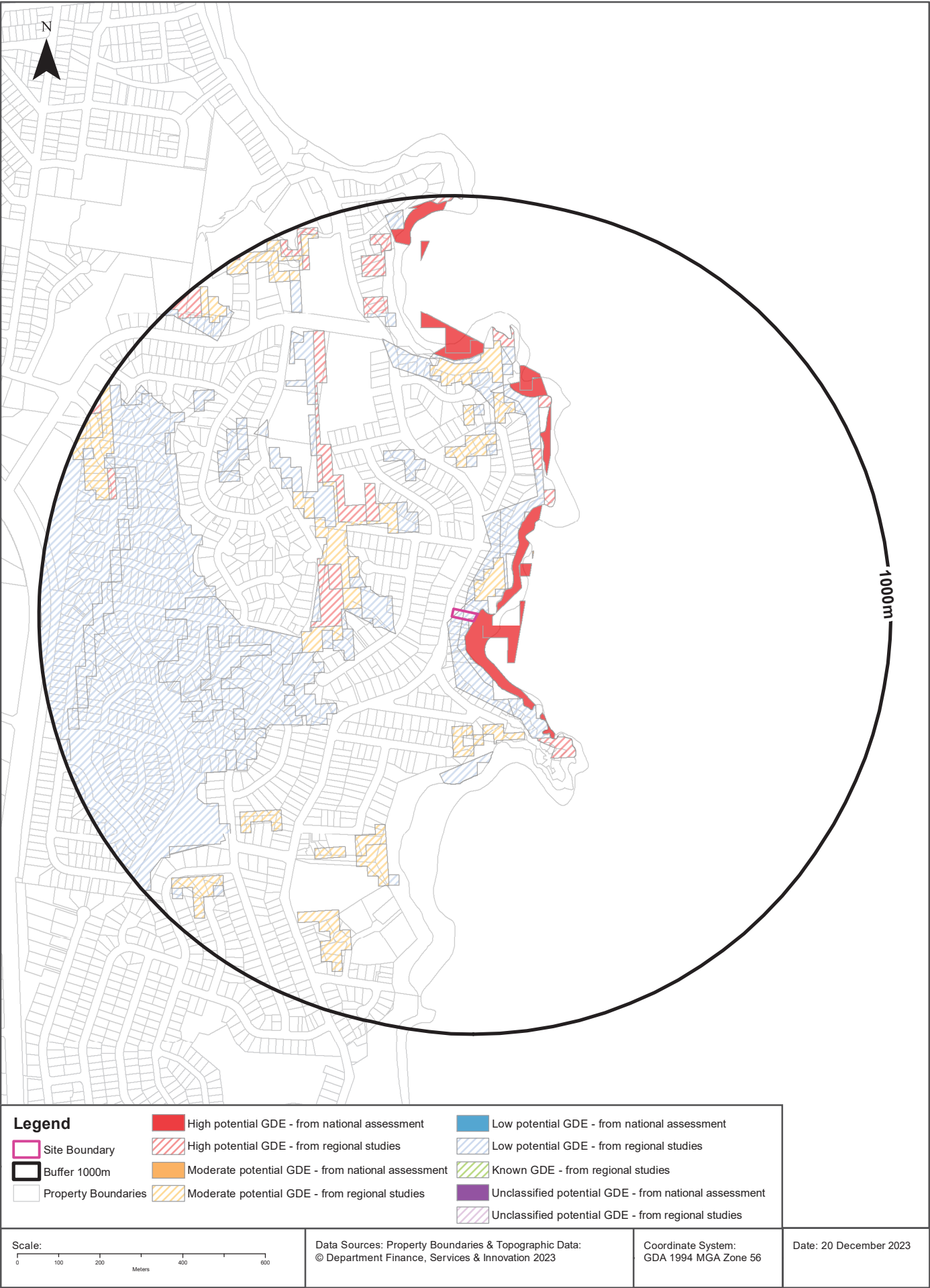
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Ramsar Wetlands

What Ramsar Wetland areas exist within the dataset buffer?

Map Id	Ramsar Name	Wetland Name	Designation Date	Source	Distance	Direction
N/A	No records in buffer					

Ramsar Wetlands Data Source: © Commonwealth of Australia - Department of Agriculture, Water and the Environment



Ecological Constraints

217a Beach Road, Denhams Beach, NSW 2536

Groundwater Dependent Ecosystems Atlas

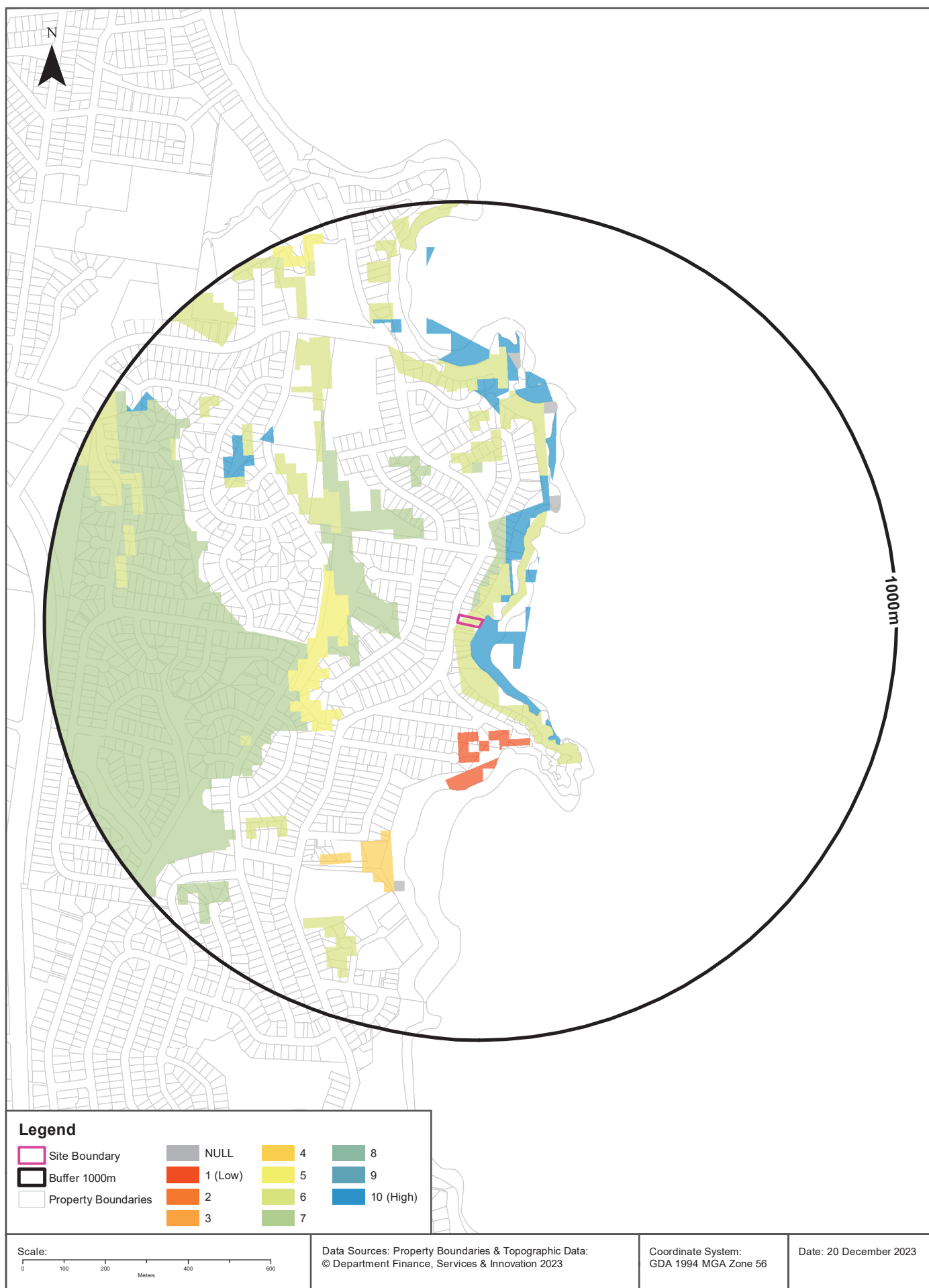
Type	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Terrestrial	Low potential GDE - from regional studies	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	High potential GDE - from national assessment	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Aquatic	High potential GDE - from national assessment	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Wetland	Consolidated sedimentary	25m	South East
Terrestrial	Moderate potential GDE - from regional studies	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		30m	North East
Aquatic	High potential GDE - from national assessment		Wetland	Consolidated sedimentary	137m	North East
Aquatic	Moderate potential GDE - from national assessment		Wetland	Consolidated sedimentary	188m	North East
Terrestrial	High potential GDE - from regional studies	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		263m	West
Terrestrial	High potential GDE - from regional studies		Vegetation		522m	North
Terrestrial	Low potential GDE - from regional studies		Vegetation		637m	South

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology

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Ecological Constraints - Inflow Dependent Ecosystems Likelihood

217a Beach Road, Denhams Beach, NSW 2536



Ecological Constraints

217a Beach Road, Denhams Beach, NSW 2536

Inflow Dependent Ecosystems Likelihood

Type	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Terrestrial	6	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	10	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	7	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		16m	North
Aquatic	10	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Wetland	Consolidated sedimentary	25m	South East
Aquatic	10		Wetland	Consolidated sedimentary	137m	North East
Terrestrial	1	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		251m	South
Terrestrial	5	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		263m	West
Terrestrial		Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		311m	North East
Terrestrial			Vegetation		522m	North
Terrestrial	4	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		526m	South West

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology

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Ecological Constraints

217a Beach Road, Denhams Beach, NSW 2536

NSW BioNet Atlas

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km of the site?

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Amphibia	Litoria aurea	Green and Golden Bell Frog	Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Actitis hypoleucos	Common Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Category 2	Critically Endangered	
Animalia	Aves	Apus pacificus	Fork-tailed Swift	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ardena carneipes	Flesh-footed Shearwater	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Ardena grisea	Sooty Shearwater	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Ardena pacifica	Wedge-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Ardena tenuirostris	Short-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Calidris alba	Sanderling	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Category 3	Endangered	
Animalia	Aves	Calyptorhynchus lathamii lathamii	South-eastern Glossy Black-Cockatoo	Vulnerable	Category 2	Vulnerable	
Animalia	Aves	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Diomedea exulans	Wandering Albatross	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Diomedea gibsoni	Gibson's Albatross	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Esacus magnirostris	Beach Stone-curlew	Critically Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Falco subniger	Black Falcon	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Fregetta grallaria	White-bellied Storm-Petrel	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Gallinago hardwickii	Latham's Snipe	Not Listed	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Glossopsitta pusilla	Little Lorikeet	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haematopus fuliginosus	Sooty Oystercatcher	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haematopus longirostris	Pied Oystercatcher	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hieraaetus morphnoides	Little Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hirundapus caudacutus	White-throated Needletail	Not Listed	Not Sensitive	Vulnerable	ROKAMBA;CAMBA; JAMBA

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Hydroprogne caspia	Caspian Tern	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Ixobrychus flavicollis	Black Bittern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Lathamus discolor	Swift Parrot	Endangered	Not Sensitive	Critically Endangered	
Animalia	Aves	Limosa lapponica	Bar-tailed Godwit	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Lophoictinia isura	Square-tailed Kite	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Macronectes giganteus	Southern Giant Petrel	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Ninox connivens	Barking Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Ninox strenua	Powerful Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Numenius madagascariensis	Eastern Curlew	Not Listed	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Numenius phaeopus	Whimbrel	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Onychoprion fuscata	Sooty Tern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pachycephala olivacea	Olive Whistler	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pandion cristatus	Eastern Osprey	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Petroica boodang	Scarlet Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pluvialis squatarola	Grey Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Pterodroma solandri	Providence Petrel	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ptilinopus superbus	Superb Fruit-Dove	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Puffinus assimilis	Little Shearwater	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pycnoptilus floccosus	Pilotbird	Not Listed	Not Sensitive	Vulnerable	
Animalia	Aves	Rhipidura fuliginosa	New Zealand Fantail (Lord Howe Is. subsp.)	Extinct	Not Sensitive	Extinct	
Animalia	Aves	Rhipidura fuliginosa	New Zealand Fantail (Lord Howe Is. subsp.)	Presumed Extinct	Not Sensitive	Extinct	
Animalia	Aves	Stercorarius parasiticus	Arctic Jaeger	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Stercorarius pomarinus	Pomarine Jaeger	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Sterna hirundo	Common Tern	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Stictonetta naevosa	Freckled Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Thalassarche cauta	Shy Albatross	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Thalassarche melanophris	Black-browed Albatross	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Thalasseus bergii	Crested Tern	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Thinornis cucullatus	Eastern Hooded Dotterel	Critically Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Tyto novaehollandiae	Masked Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Tyto tenebricosa	Sooty Owl	Vulnerable	Category 3	Not Listed	
Animalia	Mammalia	Arctocephalus forsteri	New Zealand Fur-seal	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Arctocephalus pusillus doriferus	Australian Fur-seal	Vulnerable	Not Sensitive	Not Listed	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Mammalia	Cercartetus nanus	Eastern Pygmy-possum	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Not Sensitive	Endangered	
Animalia	Mammalia	Eubalaena australis	Southern Right Whale	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Isodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus australis	Little Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Myotis macropus	Southern Myotis	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Petauroides volans	Southern Greater Glider	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Petaurus australis	Yellow-bellied Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Petaurus australis	Yellow-bellied Glider	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Petaurus norfolkensis	Squirrel Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Phascogale tapoatafa	Brush-tailed Phascogale	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Phascolarctos cinereus	Koala	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Physeter macrocephalus	Sperm Whale	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheath-tail-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Scoteanax rueppellii	Greater Broad-nosed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Sminthopsis leucopus	White-footed Dunnart	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	Caretta caretta	Loggerhead Turtle	Endangered	Not Sensitive	Endangered	
Animalia	Reptilia	Chelonia mydas	Green Turtle	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Reptilia	Dermochelys coriacea	Leatherback Turtle	Endangered	Not Sensitive	Endangered	
Animalia	Reptilia	Eretmochelys imbricata	Hawksbill Turtle	Not Listed	Not Sensitive	Vulnerable	
Plantae	Flora	Correa baeuerlenii	Chef's Cap Correa	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Cryptostylis hunteriana	Leafless Tongue Orchid	Vulnerable	Category 2	Vulnerable	
Plantae	Flora	Eucalyptus kartzoffiana	Araluen Gum	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Galium australe	Tangled Bedstraw	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Genoplesium vernale	East Lynne Midge Orchid	Vulnerable	Category 2	Vulnerable	
Plantae	Flora	Haloragis exalata subsp. exalata	Square Raspwort	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Persicaria elatior	Tall Knotweed	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Pomaderris bodalla	Bodalla Pomaderris	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Rhodamnia rubescens	Scrub Turpentine	Critically Endangered	Not Sensitive	Critically Endangered	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Plantae	Flora	Syzygium paniculatum	Magenta Lilly Pilly	Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	Thesium australe	Austral Toadflax	Vulnerable	Not Sensitive	Vulnerable	

Data does not include NSW category 1 sensitive species.

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Area Match	Georeferenced to an approximate or general area
Road Match	Georeferenced to a road or rail corridor
Road Intersection	Georeferenced to a road intersection
Buffered Point	A point feature buffered to x metres
Adjacent Match	Land adjacent to a georeferenced feature
Network of Features	Georeferenced to a network of features
Suburb Match	Georeferenced to a suburb boundary
As Supplied	Spatial data supplied by provider

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APPENDIX E

Definitions and Limitations

DESCRIPTION AND CLASSIFICATION OF SOILS

The methods of description and classification of soils used in this report are based on the Australian Standard 1726 – 1993, Geotechnical site investigations. In general, descriptions cover the following properties – soil type, colour, secondary grain size, structure, inclusions, strength or density and geological description.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (e.g. sandy clay) on the following basis:

Classification	Particle Size
Clay	Less than 0.002mm
Silt	0.002mm to 0.06mm
Sand	0.06mm to 2.00mm
Gravel	2.00mm to 60.00mm
Cobbles	60mm (63mm) to 200mm
Boulders	>200mm

Soils are also classified according to the Unified Soil Classifications System which is included in this Appendix. Rock types are classified by their geological names.

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The terms are defined as follows:

Consistency	Shear Strength s_u (kPa) (Representative Undrained Shear)	
Very soft	< 12	<2 (~SPT “N”)
Soft	12 - 25	2-4
Firm	25 - 50	4-8
Stiff	50 – 100	8-15
Very Stiff	100 – 200	15-30
Hard	> 200	>30

Non-cohesive soils are classified on the basis of relative density, generally from the results of in-situ standard penetration tests as below:

Term	Relative Density (%)	SPT Blows/300mm ‘N’
Very loose	< 15	<4
Loose	15-35	4-10
Medium dense	35-65	10-30
Dense	65-85	30-50
Very Dense	>85	>50

SAMPLING

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are generally taken by one of two methods:

1. Driving or pushing a thin walled sample tube into the soil and withdrawing with a sample of soil in a relatively undisturbed state.
2. Core drilling using a retractable inner tube (R.I.T.) core barrel.

Such samples yield information on structure and strength in additions to that obtained from disturbed samples and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

PENETRATION TESTING

The relative density of non-cohesive soils is generally assessed by in-situ penetration tests, the most common of which is the standard penetration test. The test procedure is described in Australian Standard 1289 "Testing Soils for Engineering Purposes" Testing Soils for Engineering Purposes" – Test No. F3.1.

The standard penetration test is carried out by driving a 50mm diameter split tube penetrometer of standard dimensions under the impact of a 63 kg hammer having a free fall of 750mm.

The "N" value is determined as the number of blows to achieve 300mm of penetration (generally after disregarding the first 150mm penetration through possibly disturbed material). The results of these tests can be related empirically to the engineering properties of the soil.

The test is also used to provide useful information in cohesive soils under certain conditions, a good quality disturbed sample being recovered with each test. Other forms of in situ testing are used under certain conditions and where this occurs, details are given in the report.

DEFINITIONS OF ROCK, SOIL, AND DEGREES OF CHEMICAL WEATHERING

GENERAL DEFINITIONS – ROCK AND SOIL

ROCK In engineering usage, rock is a natural aggregate of minerals connected by strong and permanent cohesive forces.

Note: Since “strong” and “permanent” are subject to different interpretations, the boundary between rock and soil is necessarily an arbitrary one.

SOIL In engineering usage, soil is a natural aggregate of mineral grains which can be separated by such gentle mechanical means as agitation in water, can be remoulded and can be classified according to the Unified Soil Classification System. Three principal classes of soil recognized are:

Residual soils: soils which have been formed in-situ by the chemical weathering of parent rock. Residual soil may retain evidence of the original rock texture or fabric or, when mature, the original rock texture may be destroyed.

Transported soils: soils which have been moved from their places of origin and deposited elsewhere. The principal agents of erosion, transport and deposition are water, wind and gravity. Two important types of transported soil in engineering geology and materials investigations are:

Colluvium – a soil, often including angular rock fragments and boulders, which has been transported downslope predominantly under the action of gravity assisted by water. The principle forming process is that of soil creep in which the soil moves after it has been weakened by saturation. It may be water borne for short distances.

Alluvium – a soil which has been transported and deposited by running water. The larger particles (sand and gravel size) are water worn.

Lateritic soils: soils which have formed in situ under the effects of tropical weathering include all reddish residual and non residual soils which genetically form a chain of material ranging from decomposed rock through clay to sesqui-oxide rich crusts. The term does not necessarily imply any compositional, textural or morphological definition; all distinctions useful for engineering purposes are based on the differences in geotechnical characteristics.

ROCK WEATHERING DEFINITIONS

Extremely Weathered (EW)	Rock substance affected by weathering to the extent that the rock exhibits soil properties, i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered (HW)	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of the chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered (MW)	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance and the original colour of the fresh rock is no longer recognisable.
Slightly Weathered (SW)	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance, usually by limonite, has taken place. The colour and texture of the fresh rock is recognisable.
Fresh (Fr)	Rock substance unaffected by weathering.

The degrees of rock weathering may be gradational. Intermediate stages are described by dual symbols with the prominent degree of weathering first (e.g. EW-HW).

The various degrees of weathering do not necessarily define strength parameters as some rocks are weak, even when fresh, to the extent that they can be broken by hand across the fabric, and some rocks may increase in strength during the weathering process.

Fresh drill cores of some rock types, such as basalt and shale may disintegrate after exposure to the atmosphere due to slaking, desiccation, expansion or contraction, stress relief or a combination of any of these factors.

AN ENGINEERING CLASSIFICATION OF SEDIMENTARY ROCKS

This classification system provides a standardised terminology for the engineering description of the sandstone and shales in the Sydney area, but the terms and definitions may be used elsewhere when applicable. Where other rock types are encountered, such as in dykes, standard geological descriptions are used for rock types and the same descriptions as below are used for strength, fracturing and weathering.

Under this system rocks are classified by Rock Type, Strength, Stratification Spacing, Degree of Fracturing and Degree of Weathering. These terms do not cover the full range of engineering properties. Descriptions of rock may also need to refer to other properties (e.g. durability, abrasiveness, etc) where these are relevant.

ROCK TYPE DEFINITIONS

ROCK TYPE	DEFINITION
Conglomerate:	More than 50% of the rock consists of gravel sized (greater than 2mm) fragments.
Sandstone:	More than 50% of the rock consists of sand sized (0.06 to 2mm) grains.
Siltstone:	More than 50% of the rock consists of silt-sized (less than 0.06mm) granular particles and the rock is not laminated.
Claystone:	More than 50% of the rock consists of silt or clay sized particles and the rock is not laminated.
Shale:	More than 50% of the rock consists of silt or clay sized particles and the rock is laminated.

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, e.g. clayey sandstone, sandy shale.

STRATIFICATION SPACING

Term	Separation of Stratification Planes
Thinly Laminated	< 6mm
Laminated	6mm to 20mm
Very thinly bedded	20mm to 60mm
Thinly bedded	60mm to 0.2m
Medium bedded	0.2m to 0.6m
Thickly bedded	0.6m to 2m
Very thickly bedded	> 2m

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks.

Term	Description
Fragmented:	The core is comprised primarily of fragments of length less than 20mm, and mostly of width less than the core diameter
Highly Fractured:	Core lengths are generally less than 20mm – 40mm with occasional fragments.
Fractured:	Core lengths are mainly 30mm – 100mm with occasional shorter and longer section.
Slightly Fractured:	Core lengths are generally 300mm – 1000mm with occasional longer sections and occasional sections of 100mm – 300mm.
Unbroken:	The core does not contain any fracture.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Society of Rock Mechanics.

Term	Point Load Index Is(50) MPa	Field Guide	Approx qu MPa*
Extremely Weak:	0.03	Easily remoulded by hand to a material with soil properties.	0.7
Very Weak:	0.1	May be crumbled in the hand. Sandstone is “sugary” and friable.	2.4
Weak:	0.3	A piece of core 150mm long x 50mm dia. May be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	7
Medium Strong:	1	A piece of core 150mm long x 50mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.	24
Strong: (SW)	3	A piece of core 150mm long x 50mm dia. core cannot be broken by unaided hands, can be slightly scratched or scored with knife.	70
Very Strong (SW)	10	A piece of core 150mm long x 50mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	240
Extremely Strong (Fr)	>10	A piece of core 150mm long x 50mm dia. is difficult to break with hand held hammer. Rings when struck with a hammer.	>240

The approximate unconfined compressive strength (qu) shown in the table is based on an assumed ratio to the point load index of 24:1. This ratio may vary widely.

Unified Soil Classification System (Metricated)

Data for Description Identification and Classification of Soils

MAJOR DIVISIONS			DESCRIPTION			FIELD IDENTIFICATION							Group Symbol	% [2] 0.06mm	PLASTICITY OF FINE FRACTION									
			Group Symbol	Graphic Symbol	TYPICAL NAME	DESCRIPTIVE DATA	GRAVELS AND SANDS																	
							GRADATIONS		NATURE OF FINES	DRY STRENGTH														
COARSE GRAINED SOILS	GRAVELS	More than 50% of coarse grains are greater than 2.0mm	GW		Well graded gravels and gravel-sand mixtures, little or no fines	Determine approximate percentages of material over 60mm size, maximum size, shape, surface texture, hardness of material, geological description. Identify on estimated percentage mass of the various fractions.	COARSE GRAINED SOILS	More than half of the material less than 60mm is larger than 0.06mm	0.06mm is about the smallest particle visible to the naked eye	GOOD	Wide range in grain size	"Clean" materials (not enough fines to band coarse grains)	None	GW	0-5	-								
			GP		Poorly graded gravels and gravel-sand mixtures, little or no fines					POOR	Predominantly one size or range of sizes			GP	0-5	-								
			GM		Silty gravels, gravel-sand-silt mixtures					GOOD TO FAIR	"Dirty" materials (Excess of fines)	Fines are non-plastic (I)	None to medium	GM	12-50	Below 'A' line and 1								
			GC		Clayey gravels gravel-sand-clay mixtures									GC	12-50	Above 'A' line and 7								
	SANDS	More than 50% of coarse grains are greater than 2.0mm	SW		Well graded sands and gravelly sands, little or no fines					GOOD	Wide range in grain size	"Clean" materials (not enough fines to band coarse grains)	None	SW	0-5	-								
			SP		Poorly graded sands and gravelly sands, little or no fines					POOR	Predominantly one size or range of sizes			SP	0-5	-								
			SM		Silty sand, sand-silt mixtures					GOOD TO FAIR	"Dirty" materials (Excess of fines)	Fines are non-plastic (I)	None to medium	SM	12-50	Below 'A' line or 1								
			SC		Clayey sands, sand-clay mixtures									SC	12-50	Above 'A' line and 1								
	Use the gradation curve of material passing 60mm for classification of fractions according to criteria given under "Major Division".																							
	FINE GRAINED SOILS	Liquid Limit less than 50%	More than 50% by dry mass, less than 60mm is less than 0.06mm	ML						Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	Determine approximate percentages of material over 60mm size, maximum size, shape, surface texture, hardness of material, geological description. Identify on estimated percentage mass of the various fractions.	FINE GRAINED SOILS	More than half of the material less than 50mm is less than 0.06mm	0.06mm is about the smallest particle visible to the naked eye	SILT AND CLAY FRACTION				ML	More than 50% passing 0.06mm				
Fraction smaller than 0.20mm AS sieve size																								
CL					Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	DRY STRENGTH	DILATANCY	TOUGHNESS																
OL					Organic silts and organic silty clays of low plasticity	None to low	Quick to slow	None																
Liquid Limit more than 50%				More than 50% by dry mass, less than 60mm is less than 0.06mm	MH		Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	Medium to high	None to very slow	Medium														
					CH		Inorganic clays of high plasticity, fat clays	Low to medium	Slow	Low														
		OH			Organic clays of medium to high plasticity	Low to medium	Slow to none	Low to medium																
		PT			Peat muck and other highly organic soils	High to very high	None	High																
Use the gradation curve of material passing 60mm for classification of fractions according to criteria given under "Major Division".																								
Readily identified by colour, odour, spongy feel and generally by fibrous texture																								
*Effervescence with H2O2																								

Limitations in the Use and Interpretation of this Geotechnical Report

Our Professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The geotechnical report was prepared for the use of the Owner in the design of the subject development and should be made available to potential contractors and/or the Contractor for information on factual data only. This report should not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by the interpretive borehole and test pit logs, cross-sections, or discussion of subsurface conditions contained herein.

The analyses, conclusions and recommendations contained in the report are based on site conditions as they presently exist and assume that the exploratory bore holes, test pits, and/or probes are representative of the subsurface conditions of the site. If, during construction, subsurface conditions are found which are significantly different from those observed in the exploratory bore holes and test pits, or assumed to exist in the excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between conducting this investigation and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions and the recommendations considering the changed conditions and time lapse.

The summary bore hole and test pit logs are our opinion of the subsurface conditions revealed by periodic sampling of the ground as the test holes progressed. The soil descriptions and interfaces between strata are interpretive and actual changes may be gradual.

The bore hole and test pit logs and related information depict subsurface conditions only at the specific locations and at the particular time designated on the logs. Soil conditions at the other locations may differ from conditions occurring at these bore hole and test pit locations. Also, the passage of time may result in a change in the soil conditions at these test locations.

Groundwater levels often vary seasonally. Groundwater levels reported on the boring logs or in the body of the report are factual data only for the dates shown.

Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples, bore holes or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. It is recommended that the Owner consider providing a contingency fund to accommodate such potential extra costs.

This firm cannot be responsible for any deviation from the intent of this report including, but not restricted to, any changes to the scheduled time of construction, the nature of the project or the specific construction methods or means indicated in this report: nor can our company be responsible for any construction activity on sites other than the specific site referred to in this report.