PRELIMINARY AND DETAILED SITE CONTAMINATION INVESTIGATION REPORT

HORNBY LIGHTHOUSE, WATSONS BAY NSW 2030

PREPARED FOR THE
PORT AUTHORITY OF NEW SOUTH WALES
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Client:
Port Authority of New South Wales
Level 4, 20 Windmill Street
Walsh Bay NSW 2000
Attention: Sam Isaacs
Email: sisaacs@portauthority.nsw.com.au

Author: S. McCormack (B.E – civil, hons) – CEnvP (#928), MIEAust, NER (environmental)
(Contaminated Land Specialist No. SC40929)
Field Engineer/Scientist: S. McCormack & S. Gartland

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EXECUTIVE SUMMARY

Geo-Environmental Engineering Pty Ltd (GEE) was commissioned by the Port Authority of New South Wales to undertake a preliminary and detailed site contamination investigation at Hornby Lighthouse, South Head Heritage Trail, Watsons Bay New South Wales 2030 (herein referred to as the 'site'). The allotment in which the lighthouse has been constructed covers an area of approximately 1,000m^2, and is legally identified Lot 415 in Deposited Plan (DP) 752011. As much of the eastern and north-eastern part of this allotment comprises an exposed sandstone cliffline which is rugged and relatively inaccessible, the area which was the subject of our investigation (referred to as the investigation area) covers an area of approximately 700m^2 and is legally identified as Part Lot 415 DP752011 and Part Lot 1 DP605078.

The investigation follows the recent refurbishment of the Lighthouse and was requested to supplement a Targeted Contamination Investigation that was completed by JMB Environmental Consulting (JMB) in 2023 which had identified surface soils around the Lighthouse that had been impacted by Lead, and to a lesser extent Zinc, at concentrations in excess of those permissible for the proposed land-use, and which could impact the current and future users of the site.

The investigation was required to better define the extent and type of contamination, and to address the requirements of Chapter 4 of the *State Environmental Planning Policy (Resilience and Hazards) 2021* (reference 2).

The investigation comprised a:

- A review of the environmental and physical setting in which the site lies, including geology, hydrogeology and topography,
- A review of the history of the site and surrounding land using readily available records and historical aerial photographs,
- A site inspection for potential sources of contamination,
- Preparation of an initial Conceptual Site Model (CSM),
- Field investigations including:
  - The excavation of twenty-one shallow testpits (TP1 to TP21) across the Site investigation area, subject to accessibility, and
  - The collection of a near-surface soil samples from each of the testpits.
- Laboratory analysis of selected soil samples for the contaminants of concern, and

◊ Preparation of this report including the comparison of the laboratory analytical results against relevant NSW EPA endorsed guidelines.

The review of the site's history and the site inspection revealed evidence of some potential contaminating activities that may have resulted in site contamination. Specifically:

◊ Potential for fill material to be present and when sourced from an unknown origin, the quality of the fill not known and therefore may be contaminated, and

◊ Potential use of lead-based paints on the Lighthouse and the weathering / degradation of this paint along with any renovations or maintenance of the Lighthouse may have resulted in near surface soils being impacted with lead.

◊ Potential use of pesticides to control vegetation / weeds around the Lighthouse.

◊ Past and Present Vehicle Movements. Such vehicles accessing and parking on site may have resulted in leaks and spillage of fuel and oils.

Based on observations made during the field investigations, the sampling and analysis program conducted at the site, the proposed land-use and with respect to relevant statutory guidelines, GEE conclude that there exists concentrations of metals (specifically, lead, copper and zinc) and to a lesser extent TRH, within the relatively shallow soil profile above the health-based site assessment criteria appropriate for the current and future land-use, and therefore will require remediation. The area requiring management and/or remediation is shown on Figure 3.

In conclusion, the site is not currently considered to be suitable for the existing land-use. However, the site can be made suitable for the proposed development by undertaking convention management and/or remediation measures. In accordance with State and local planning guidelines a Remedial Action Plan (RAP) will be required to detail the proposed remediation methodology.

1 PROJECT INFORMATION

1.1 INTRODUCTION AND OBJECTIVES

Geo-Environmental Engineering Pty Ltd (GEE) was commissioned by the Port Authority of New South Wales to undertake a preliminary and detailed site contamination investigation associated with the Hornby Lighthouse which is located at the northern end of the South Headland peninsula within the suburb of Watsons Bay NSW. A location map is provided for reference as **Figure 1**.

The investigation follows the recent refurbishment of the Lighthouse and was requested to supplement a Targeted Contamination Investigation that was completed by JMB Environmental Consulting (JMB) in 2023 (reference 1). The JMB investigation identified surface soils around the Lighthouse that had been impacted by Lead, and to a lesser extent Zinc, at concentrations in excess of those permissible for the proposed land-use, and which could impact the current and future users of the site.

To better define the extent and type of contamination, and to address the requirements of Chapter 4 of the *State Environmental Planning Policy (Resilience and Hazards) 2021* (reference 2), GEE has completed a *Preliminary Site Investigation* (PSI) and a *Detailed Site Investigation* (DSI) in accordance with the NSW Environment Protection Authority (NSW EPA) in the *Contaminated Land Guidelines: Consultants Reporting on Contaminated Land* (reference 2) and NEPM 1999 (revised 2013) Schedule B(2) *Guideline on Site Characterisation* (reference 3).

The investigation area for this investigation covered an area of approximately 700m^2 and included readily accessible land around the Lighthouse which is partly within Lot 415 in Deposited Plan (DP) 752011 (in which the Lighthouse itself is located) and Part of the adjoining Lot 1 in DP605078. This investigation area is depicted in **Figure 2**. And is also herein referred to as the 'Site'.

1.2 PREVIOUS INVESTIGATIONS

In September 2023, JMB Environmental Consulting completed a Targeted Contamination Investigation for the site (reference 1) with the aim of identifying potential contamination (heavy metal and / or asbestos) prior to planned refurbishment works taking place. The scope of works for the investigation included:

◊ An inspection of the site and the lighthouse,

- The collection of five near-surface soil samples surrounding the lighthouse (TP01 to TP05),
- Analysis of the five near-surface soil samples for asbestos and priority metals (i.e. arsenic, cadmium, chromium, copper, nickel, lead, mercury and zinc),
- Selective samples of building materials (e.g. mortar, paint) associated with the lighthouse as part of a limited Hazardous Materials Audit (HMA).
- Analysis of the material samples for either asbestos or metals (arsenic, chromium and lead).

In summary, there was no asbestos detected in each of the material and soil samples. With respect to the paint samples, some samples were confirmed to be lead based paint. Finally, three of the five soil samples (i.e. TP03, TP04 and TP05) had concentrations of Lead above the ecological and/or health-based criteria that is relevant for the site and the surrounding environment. Two of these samples (TP03 and TP05) also had concentrations of Zinc above the ecological based criteria.

A copy of the JMB report is provided for reference in **Appendix A**.

1.3 Scope of Works

The scope of works completed by GEE, to achieve the above objectives, is provided below:

- A review of the environmental and physical setting in which the site lies, including geology, hydrogeology and topography,
- A review of the history of the site and surrounding land,
- A site inspection for potential sources of contamination,
- Preparation of an initial Conceptual Site Model (CSM),
- Field investigations including:
  - The excavation of twenty-one shallow testpits (TP1 to TP21) across the Site investigation area, subject to accessibility, and
  - The collection of a near-surface soil samples from each of the testpits.
- Laboratory analysis of the soil samples for the contaminants of concern, and
- Preparation of this report including the comparison of the laboratory analytical results against relevant NSW EPA endorsed guidelines.

2 SITE IDENTIFICATION

A summary of the site location details is provided below, while a site location map is provided as **Figure 1**:

Street Address:	Hornby Lighthouse, South Head Heritage Trail, Watsons Bay NSW 2030
Legal Description:	Part of Lot 415 in Deposited Plan (DP) 752011 and Part of Lot 1 in DP605078
Coordinates (MGA 56):	-33.836330 Lat, 151.280500 Long
Local Government Area:	Woollahra Municipal Council
Site Area:	~700m^2 (Refer to Figure 2)
Current Zoning:	SP2 – Navigation & Emergency Response Facility[1]
Current Use:	Recreation / Public Open Space
Proposed Zoning:	SP2 – Navigation & Emergency Response Facility
Proposed Use:	Recreation / Public Open Space

[1] Woollahra Local Environment Plan 2014.

3 SITE HISTORY

The history of the site was researched to provide an understanding of past and present site activities, which in turn may indicate sources and areas of potential contamination as well as potential chemicals of concern.

Information obtained and reviewed included:

- ◊ Historical aerial photographs dating back to 1930, as supplied by the NSW Land and Property Information, or online sources such as Google Earth, and obtained by Lotsearch Pty Ltd.
- ◊ Historical title information obtained from Info Track.
- ◊ Available business directory records from between 1950 and 1991 which is provided in the Lotsearch Report.
- ◊ An internet search for any relevant historical information about the site.
- ◊ Council records of past development applications and approvals.
- ◊ A search of historical Google Street View Photographs.
- ◊ A search of the contaminated land database, which is available on the NSW EPA website, was conducted which reveals if there have been any records of written notices issued on the site by EPA under the Contaminated Land Management Act 1997 (CLM Act), including preliminary investigation orders. Additionally, the search can reveal if the site has ever been notified to the EPA under Section 60 duty to report contaminated sites, of the CLM Act.
- ◊ A search of the Department of Defence database for the location of Defence Controlled Areas and potential areas of Unexploded Ordnances.
- ◊ A search of records under the PFAS investigation program.
- ◊ A search of the NSW EPA Protection of the Environment Act public register of licences, applications and notices that are maintained under Section 308 of the Protection of the Environment Operations (POEO) Act 1997.
- ◊ A search of local and state heritage registers.

3.1 HISTORICAL AERIAL PHOTOGRAPHS

Historical aerial photography was sourced by Lotsearch Pty Ltd and included in their report, a copy of which is provided in **Appendix B**. This included aerial photographs from between 1930 and 2024. A summary of the findings from each photograph is provided below with information (where possible) from our site inspection.

Year	**Site**	**Surrounding Land**
1930	The low resolution of the image prevents thorough inspection; however, the circular shape of the lighthouse is evident as well as the shadow it casts.	The surrounding area appears to be largely undeveloped, however, the existing two houses to the west of the lighthouse appear to have already been constructed. There also appears to be some buildings located approximately 100-150m to the south of the Lighthouse where the existing HMAS Watson base is located. A circular fortification (gun emplacement) pit associated with World War 1 (WW1) is also evident approximately 80m to the south of the site.
1943	The image is much clearer, allowing for a more thorough inspection of the site. The only notable features on the site are the lighthouse and minor ground disturbance associated with a path leading towards the lighthouse.	With the clearer image, it becomes evident that the two houses to the west of the site also have some smaller structures (probably sheds) associated with them. Additional circular fortification pits are also visible in the surrounding area, in multiple areas around the edge of the peninsula, including at least three south to south-east of the site, two to the south-west, and one to the north-west. A rectangular structure (and its shadow) is also visible immediately to the north of the site and this is the existing concrete enclosure which appears to have been used as a lookout.
1951	No significant changes.	There has been an addition to the residential building immediately to the west of the site, and a fence or wall has been constructed surrounding the building. The large (likely high density residential) buildings observed approximately 150m south of the site have been demolished, except for one building.

1955	No significant changes.	A fence or wall has been constructed surrounding the residential building approximately 100m to the west of the site. A small structure (likely residential) has been constructed approximately 120m south of the site, with a path linking it to the two nearby circular fortification pits. A large industrial style building has been constructed beyond 150m south of the site.
1961	A few vehicles are visible on the site. Otherwise, there are no significant changes from the previous photograph.	Two smaller buildings have been constructed approximately 100m to the south-west of the site. Two additional large industrial style buildings have been constructed beyond 150m south of the site.
1965	No significant changes.	No significant changes.
1970	No significant changes.	The two buildings 100m to the south-west of the site have been demolished.
1978	No significant changes.	A small car park has been established approximately 150m to the south of the site.
1982	No significant changes.	No significant changes.
1986	No significant changes.	No significant changes.
1991	No significant changes.	Roads have become more defined approximately 150m south of the site. Otherwise, no significant changes.
1994	No significant changes.	The road approximately 70m to the south-west of the site has been sealed.
2006	No significant changes.	There is a noticeable increase in vegetation (trees and shrubs) to the west and south-west of the site.

		An oval walking track has been established to the west, south-west, and south of the site. A helicopter pad has been constructed approximately 150m south-west of the site. Two (possibly residential) buildings approximately 170m south of the site have been replaced by newer buildings. The former car park 150m to the south of the site, which was initially observed in the 1978 photograph, has been replaced by grass.
2014	No significant changes.	No significant changes.
2024	Scaffolding has been placed around the lighthouse as part of the recent refurbishment works. Otherwise, no significant changes.	Tree cover in the surrounding area has increased in density. Small structures have been constructed to the south-west of the site. Approximately 150m south of the site, multiple industrial style buildings have been replaced by one large building.

In summary, the historical aerial photographs suggests that the site has remained largely unchanged since the earliest available photograph from 1930. In the 1961 and 1965 photographs, a few vehicles were observed parked near the lighthouse and in 2024, scaffolding had been erected around the lighthouse for the recently completed refurbishment works.

Surrounding land within 150m of the site was predominantly undeveloped in the earliest available photograph from 1930. Notable exceptions were two houses / cottages located to the west of the site, with the house furthest to the west being the original Lightkeepers Cottage. Although only visible in the 1943 photograph, there were likely other smaller structures present pre-1930, including the small concrete enclosure / lookout located immediately to the north of the site and some circular fortification pits. Over time there was various changes to the built environment in the surrounding area, including alterations and additions to the houses west of the site, construction of new buildings to the south associated with

the HMAS Watson Navy base, the sealing of roads and the construction of pedestrian trails. Additionally, vegetation cover (trees and shrubs) in the area west, south-west and south of the site noticeably increased between 1994 and 2006.

3.2 HISTORICAL TITLE INFORMATION

A copy of the historical title information dating back to the late 1870s is provided for reference in **Appendix C**.

In summary, the site was part of a larger allotment (Lot 721 – Alexandria, County of Cumberland, State of New South Wales) which comprised the entire northern part of the peninsula and was utilised for defence purposes. In 1944, the land was subdivided into Lots 721 and 415, with ownership of Lot 721 acquired by the Commonwealth of Australia, and Lot 415 retained by the State of NSW.

3.3 BUSINESS DIRECTORY LISTINGS

A search of available business directory listings from 1950 to 1991 was completed by Lotsearch Pty Ltd (**Appendix B**) to assist with determining any past land-use activities, and in particular past land-use activities that may cause contamination.

A review of the data revealed no business listings directly associated with the site or land within 1km.

3.4 HISTORICAL INTERNET SEARCH

An internet search of the site and surrounding area was completed by GEE to gain additional information relating to past land-use activities. This included a search for potential historical photographs and any historical documents detailing the site and the suburb which may be relevant to this investigation. Information was obtained from the Digital Archives webpage by the Woollahra Library, the Dictionary of Sydney archive webpage by the State Library of NSW, the Hornby Lighthouse webpage by Lighthouses of Australia Inc, and other websites including TripAdvisor and Warami Sydney.

Based on these sources, the Hornby Lighthouse was built in 1858 following the catastrophic wrecking of two ships (the Dunbar and Catherine Adamson) approximately two months apart, both attempting to enter Port Jackson in 1857. The lighthouse was demanded by the public after these shipwreck events, to more accurately mark the entrance to Jacksons Bay. The name Hornby Lighthouse was

derived from the name of the Commander-in-Chief of the British Pacific Fleet (and the father-in-law of Governor Denison), Sir Phipps Hornby.

Of the two cottages located to the west of the Lighthouse, the first to be constructed was the Lightkeepers Cottage that is furthest to the west. This building was completed at the same time as the Lighthouse (i.e. 1858) using sandstone quarried from the local cliff faces. Extensions and repairs were carried out on this cottage in 1860 and at this time the second cottage immediately to the west of the Lighthouse was constructed. Further additions were made to the cottages in 1877 and each cottage had a small garden surrounded by a picket fence and an underground tank stored water for general use. The cottages were not connected to mains city water until 1897.

Some photographs obtained from our internet search are provided for reference as Plates 1 to 8 below.

Plate 1 – Artist rendition of the Wreck of Dunbar, South Head, dated c1860s (Source: Dictionary of Sydney, State Library of NSW).

Plate 2 – Artist rendition of the rescue of James Johnson (the only survivor of the wreck of Dunbar), dated c1850s (Source: Dictionary of Sydney, State Library of NSW).

Plate 3 – Photograph dated c1880 (Source: Dictionary of Sydney, State Library of NSW).

The above photograph was taken approximately 20 years after Hornby Lighthouse was constructed. Fencing that wasn't observed in the historical aerial photographs can be seen in this image. The house immediately to the west of the lighthouse which is still present today can be seen in this image.

Plate 4 – Photograph dated 1902 (Source: Dictionary of Sydney, State Library of NSW).

The above photograph is another early photograph of Hornby Lighthouse, taken from further away showing more of the southern part of the cliff line. The nearby circular fortification (gun emplacement) pits (still present today) can be seen in this image.

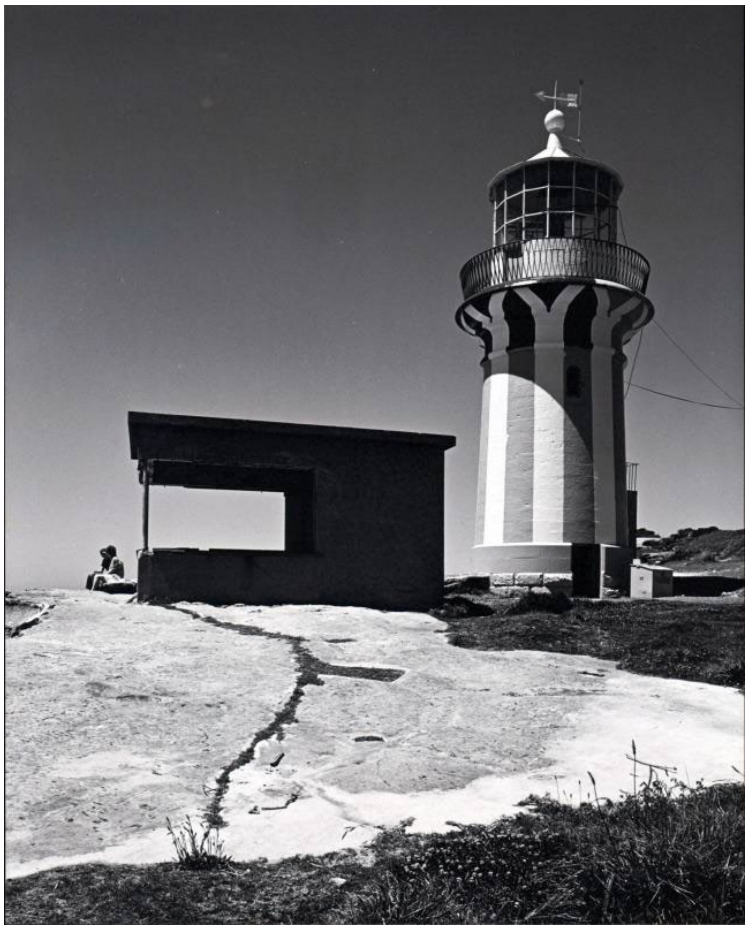

Plate 5 – Photograph dated 1987 (Source: Woollahra Libraries).

Plate 6 – Photograph dated 1996 (Source: Woollahra Libraries).

The concrete structure north of the lighthouse observed in the historical aerial photographs (still present today) can be seen in the above photographs from 1987 (Plate 5) and 1996 (Plate 6).

Plate 7 – Photograph dated 2006 (Source: Dictionary of Sydney, State Library of NSW).

Plate 8 – Photograph dated 2024 (Source: Facebook Page of Bayside Scaffolding Services).

The above photograph from 2024 shows the scaffolding that was erected around the lighthouse to assist with the recent refurbishment works.

Plate 9 – Photograph showing the Lightkeepers Cottage constructed in 1858. (Source: TripAdvisor).

3.5 COUNCIL RECORDS

GEE used the online development application search tool provided by Council to inquire about past development applications and approvals relating to the site which can provide an indication of past land-use activities. However, no useful information was available.

3.6 GOOGLE STREET VIEW PHOTOGRAPHS

Google provides Street View images for the site dating from 2014, 2016, 2019, 2021 and 2022. A review of these images revealed that the site has remained relatively unchanged.

3.7 CONTAMINATED LAND DATABASE

A search of the contaminated land database was conducted and revealed there had been no record of written notices issued on the site by the NSW Environment Protection Authority (EPA), under the Contaminated Land Management Act 1997

(CLM Act), including preliminary investigation orders. Additionally, the site has never been notified to the EPA under Section 60 duty to report contaminated sites, of the CLM Act.

Beyond the subject site, there were no properties within a 1km radius that that have been notified to the NSW EPA under Section 60 of the CLM Act. The search results are provided in the Lotsearch report in **Appendix B**.

3.8 Defence Sites and Unexploded Ordnance

A search of the Department of Defence database was conducted and has revealed the at the site is not within a Defence Controlled Area (DCA). The nearest DCA is HMAS Watson located approximately 100m to the south of the site.

The search also includes potential areas of Unexploded Ordnances (UXOs) and the nearest area of potential UXOs is the sea off Port Jackson which is located over 1km to the south-west.

3.9 EPA PFAS Investigation Program

A search of sites that are part of the EPA, Defence or Airservices Australia PFAS investigation programs was completed by Lotsearch (**Appendix B**) and identified no records within a 1km buffer.

3.10 POEO Register Search

A search of the NSW EPA Protection of the Environment Act, public register of licence, applications and notices, was undertaken as part of the Lotsearch report. The register contains information on:

- ◊ environment protection licences,
- ◊ applications for new licences and to transfer or vary existing licences,
- ◊ environment protection and noise control notices,
- ◊ penalty notices issued by the EPA,
- ◊ convictions in prosecutions under the POEO Act,
- ◊ the results of civil proceedings,
- ◊ licence review information,
- ◊ exemptions from the provisions of the POEO Act or regulations,
- ◊ approvals granted under clause 9 of the POEO (Control of Burning) Regulation,

- ◊ approvals granted under clause 7A of the POEO (Clean Air) Regulation,
- ◊ any mandatory audits required to be undertaken in relation to a licence,
- ◊ each pollution study required by a condition of a licence,
- ◊ each pollution reduction program required by a condition of a licence, and
- ◊ each penalty notice issued in relation to premises.

The search did not identify any significant records that would suggest a contamination issue for the site.

3.11 HERITAGE REGISTERS

A search of the national, state and local heritage registers was completed and is included in the Lotsearch Report (**Appendix B**). The search revealed that the Lighthouse and the two houses / cottages to the west of the site has local heritage significance (Item I462). The Lighthouse is also a significant element of the *South Head Cultural Landscape* that in on the State Heritage Register.

The search also revealed that the site lies within a National Park / Nature Reserve and part of the site (Lot 1) is a local Heritage Conservation Area which is covered by Clause 5.10 of the Woollahra Local Environment Plan (LEP) 2014.

3.12 SUMMARY OF HISTORY INFORMATION

The Site / Investigation Area

The historical information indicates that the Hornby Lighthouse was built in 1858 following the catastrophic wrecking of two ships (the Dunbar and Catherine Adamson) approximately two months apart, both attempting to enter Port Jackson in 1857. The name of the Lighthouse was derived from the name of the Commander-in-Chief of the British Pacific Fleet (and the father-in-law of Governor Denison), Sir Phipps Hornby.

The construction date of the Lighthouse pre-dates the use of Asbestos Containing Material (ACM), although lead based paints may have been used. Therefore, any renovations or maintenance of the Lighthouse may have resulted in near surface soils being impacted with lead.

Surrounding Land

The historical aerial photographs revealed that the surrounding land within ~150m of the site was predominantly undeveloped in the earliest available photograph from

1930. Notable exceptions were two Lightkeepers cottages located to the west of the site, with the cottage furthest to the west having been constructed at the same time as the Lighthouse in 1958. Extensions and repairs were carried out on this cottage in 1860 and at this time the second cottage located approximately 30m to the west of the Lighthouse was constructed. Further additions were made to these cottages in 1877, and each cottage had an underground tank stored water for general use. The cottages were not connected to mains city water until 1897.

Although only visible in the 1943 photograph, there were likely other smaller structures present pre-1930, including the small concrete enclosure / lookout located immediately to the north of the site and some circular fortification pits. Over time there was various changes to the built environment in the surrounding area, including alterations and additions to the houses west of the site, construction of new buildings to the south associated with the HMAS Watson Navy base, the sealing of roads and the construction of pedestrian trails. Additionally, vegetation cover (trees and shrubs) in the area west, south-west and south of the site noticeably increased between 1994 and 2006.

Surrounding land and land-use activities have the potential to cause contamination of the site via groundwater or vapour migration. However, the historical information did not reveal any evidence of significant contaminating activities associated with the surrounding land.

4 SITE CONDITION AND SURROUNDING ENVIRONMENT

This section of the report provides a detailed description of the physical and environmental setting of the site, including a description of the site and the presence of any visible signs of contamination.

4.1 SITE DESCRIPTION

The site is located on the north-eastern end of South Head peninsula (which is a part of Sydney Heads) and can be found along the South Head Heritage trail, a popular scenic and historical trail which provides views of Sydney Harbour to the west, Middle Head and North Head to the north, and the Tasman Sea (part of the South Pacific Ocean) to the east.

The lighthouse features distinctive red and white stripes and is situated close to the edge of the plateau, a few metres away from the eastern sandstone cliff line. There is an engineered sandstone wall surrounding the north-eastern part of the lighthouse, providing a barrier between the cliff edge and the lighthouse.

Gun emplacement pits can be seen in the immediate vicinity of the lighthouse (to the south), as well as the two lightkeepers' cottages to the west (separated from the main path by gardens). The concrete enclosure / lookout structure to the north of the lighthouse was present, however, access to the public had been prevented with fencing barriers and signage.

There was a concrete pavement (part of the South Head Heritage trail) to the west of the lighthouse (running in a North to South direction) and between the pavement and the fence of the lightkeepers' cottage there were garden beds comprising grasses, ground cover, shrubs and small trees (providing a barrier and privacy screening between the lightkeepers' cottage and public path).

At the time of our inspection, the ground surface comprised a mix of exposed sandstone bedrock, grass covered area, and exposed surface soils. In the immediate vicinity of the lighthouse, white flecks of paint (ranging from ~1 mm to ~15 mm) could be seen on the surface of exposed surface soils.

Importantly, during our site walkover inspection there was no unusual odours or surface staining that could be potentially associated with contamination. There was also no evidence of under-ground or above-ground, fuel or chemical, storage tanks

observed across the site. Additionally, there was no obvious evidence of Asbestos Containing Materials (ACM) on the surface of the site.

Photographs of the site are provided for reference in Plates 10 to 17.

Plate 10 – View towards the north showing the lighthouse (post-refurbishment) and general area south and west of the lighthouse.

Plate 11 – View towards the north, showing the lighthouse, concrete pavement, and garden bed.

Plate 12 – View towards the north-east, showing the rocky outcrops on the northern side of the lighthouse.

Plate 13 – View towards the north along South Head Heritage Trail, showing the concrete structure and garden beds to the west.

Plate 14 – View towards the south-east, showing the lighthouse, concrete structure, garden beds and the pavement.

Plate 15 – View towards the south-west, showing the rocky outcrop and sandstone wall immediately surrounding the lighthouse, and the gentle upward slope towards the south of the lighthouse.

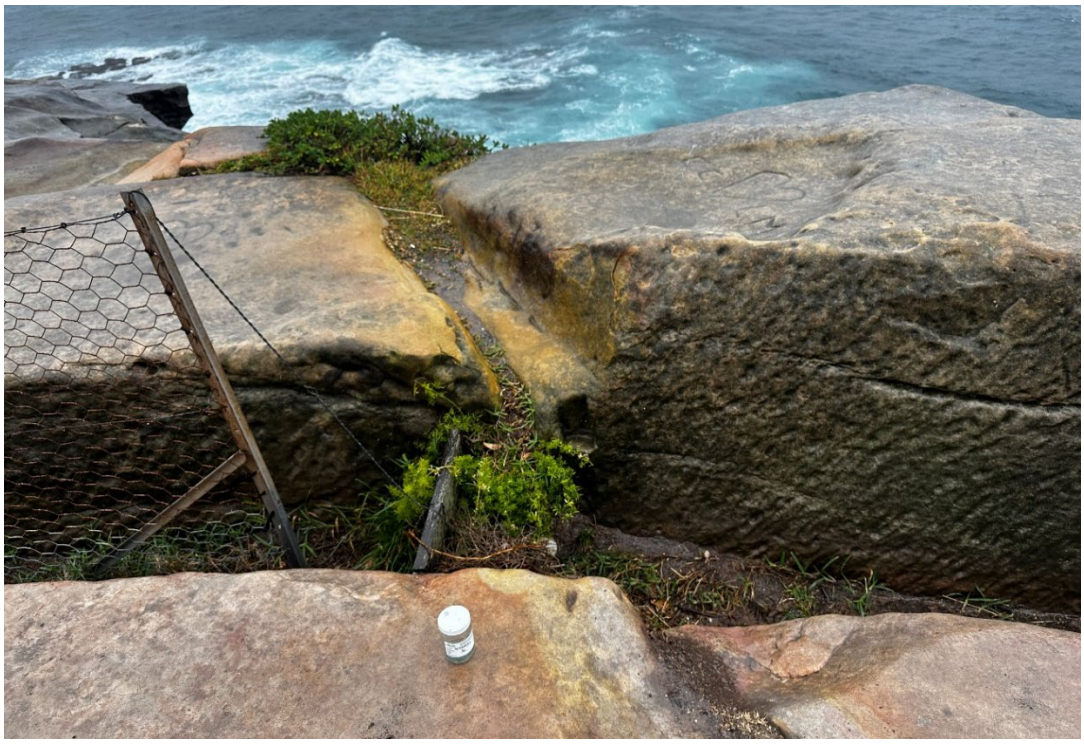

Plate 16 – View of the sandstone wall surrounding the lighthouse, showing the soils within the crevices.

Plate 17 – Example of a white paint fleck observed on the exposed surface soils.

4.2 Surrounding Land Uses and Activities

Immediate surrounding land uses observed from the aerial photographs and our site inspection is predominantly open space (zoned C1: National Parks and Nature Reserves), which is considered relatively benign from a contamination perspective. Further south is the Royal Australian Navy training base, HMAS Watson (zoned SP2: Defence).

4.3 Topography

The site is located on a plateau at the top of a north-easterly facing cliff edge. The site itself has a relatively uneven surface due to exposed sandstone bedrock, and there is a slight uphill slope from the lighthouse towards the south. According to the elevation contour map in the Lotsearch report, the surface elevation is between approximately 18m and 20m above Australian Height Datum (AHD).

4.4 Regional Geology and Soils

A review of the regional geological map (reference 5) indicates that the site is underlain by the Hawkesbury Sandstone formation, which typically consists of "*…medium to coarse-grained quartz sandstone, very minor shale and laminite lenses*".

A review of the regional soils map indicates that the site is located within the Hawkesbury Soil Landscape Group (reference 6). The Hawkesbury Group of soil is associated with rolling to very steep hills on Hawkesbury Sandstone. Local reliefs are generally between 40-200m, slopes typically >25% in gradient, with rock outcrops (>50%). Soils of the Hawkesbury Group typically comprise erosional, loose sands and clays, have very low soil fertility and form a high soil erosion hazard.

4.5 Regional Groundwater / Hydrogeology

The regional and permanent groundwater in the vicinity of the site is expected to be confined or partly confined, discrete, water-bearing zones within the bedrock formation. However, intermittent 'perched' water seepage is expected to occur at the soil/bedrock interface following rainfall events. Groundwater flow in bedrock is dominated by water movement through fractures (or joints), where stress has caused partial loss of cohesion in the rock and evidence of potential water bearing fractures is usually the presence of clay or iron-staining along the face of the joints.

A search of registered groundwater bores within 1km of the site was completed and the results are provided in the Lotsearch report (**Appendix B**). In total there were four registered bores with all of these located between 678m and 797mto the south within the residential area of Watsons Bay, and each are used for 'water supply' purposes. Given the distances involved, any contamination associated with the site is not expected to impact on these bores.

4.6 Acid Sulfate Soil Risk

Acid Sulfate Soil is naturally occurring sediments and soils containing iron sulfides (principally iron sulfide, iron disulfide or their precursors). Oxidation of these soils through exposure to the atmosphere or through lowering of groundwater levels results in the generation of sulfuric acid.

Land that may contain potential acid sulfate soils was mapped by the NSW Department of Land and Water Conservation (DLWC) and based on these maps local Councils produced their own acid sulfate soil maps to be used for planning purposes.

The regional Acid Sulfate Soil Risk Map (reference 7), indicates that the site lies within an area with no known occurrences of acid sulphate soil and land activities within this area are "...*not likely to be affected by acid sulphate soil materials*".

The ASS Planning Map produced by Council, and available via online interactive mapping, indicates that the site lies within an area defined as "Class 5". In accordance with clause 6.1 of the Watsons Bay Local Environment Plan (LEP) 2014, a preliminary assessment of acid sulfate soil and potentially a management plan is recommended for any "*Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum by which the water table is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land*".

The surface elevation is greater than 5m AHD and there is no excavation proposed at the site. As such there is no need for an acid sulphate soil assessment or management plan.

5 INITIAL CONCEPTUAL SITE MODEL

The conceptual site model (CSM) is a representation, or summary, of information obtained regarding potential contamination sources, receptors and exposure pathways between the sources and receptors. The key elements of a CSM include:

- ◊ known and potential sources of contamination, areas of environmental concern (AEC) and chemicals of potential concern (CoPC), including the mechanisms of contamination (such as 'top down' spills or sub-surface releases from corroded tanks or pipes),
- ◊ potentially affected media (such as soil, sediment, groundwater, surface water, indoor and ambient air),
- ◊ human and ecological receptors, and
- ◊ potential and complete exposure pathways.

GEE notes that this CSM is based on existing information and will require revision once more information is obtained.

5.1 POTENTIAL CONTAMINATION SOURCES AND COPC

Based on the site history information, a review of the site's physical and environmental setting, and the results of the previous field investigations, the areas of environmental concern (AEC) and potential for contamination (albeit minor) were as follows:

Table 1: Potential Contamination Sources and CoPC

Area of Environmental Concern (AEC)	Potential Contaminating Source	Chemical of Potential Concern (CoPC)	Estimated Risk of Contamination
On-Site			
Entire Site	Fill Material: There is potential for fill material to have been introduced to site. When sourced from an unknown origin, the quality of the fill not known and therefore may be contaminated.	Metals, Polycyclic Aromatic Hydrocarbons (PAHs), Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene (BTEXN), Pesticides, PCBs and Asbestos[2]	Low
Entire Site	Lead Based Paint: The age of the existing lighthouse suggests that lead based paints may have been used. Therefore, the weathering / degradation of this paint along with any renovations or maintenance of the Lighthouse may have resulted in near surface soils being impacted with lead.	Metals (in particular Lead)	High
Entire Site	Potential Pesticide Use: There is potential for the use of pesticides to manage vegetation around the lighthouse.	OCPs	Low
Vehicle Accessible Areas	Past and Present Vehicle Movements: Vehicles accessing and parking on site may have resulted in leaks and spillage of fuel and oils.	PAHs, TRH, BTEXN and Lead	Low
Off-Site			
--	--	--	--

5.2 *Potential or Known Contaminated Media*

The potential for contamination is from top-down sources and therefore the potential contaminated media is the surface soils. To a lesser extent is the deeper soil profile (where present) because there is always potential for contaminants at the surface to leach down through the soil profile.

[2] These are common contaminants of concern for developed areas across Sydney.

Groundwater is not expected to be a contaminated media given that it is likely to be present at significant depth (>10m) and confined within the sandstone bedrock formation. Soil vapour is also not a contaminated media given the lack of volatile CoPC.

5.3 CONTAMINANT RECEPTORS

Considering the existing and proposed land-uses and the site layout, potential receptors to any contamination would include:

Human Receptors

◊ Existing and future users of the site (adults and children).

Environmental Receptors

◊ Soil environments beneath the site and their associated ecosystems.

5.4 POTENTIAL EXPOSURE PATHWAYS

At this preliminary stage, potential exposure pathways include:

◊ Direct (dermal) contact for users of the site (via any unsealed areas).

◊ Ingestion of soil (adults and children) during use of the site.

6 SAMPLING AND ANALYSIS PROGRAM

The sampling and analysis program was designed with reference to the site's history, our site inspection and the initial CSM. The purpose of the program was to characterise of the soil conditions across the site in accordance with relevant EPA NSW guidelines to determine whether it would be suitable for the proposed land-use.

In accordance with NSW EPA *Contaminated Sites: Guidelines for NSW Site Auditor Scheme* (reference 8) and Appendix B of Schedule B2 of the NEPM (reference 3), the Data Quality Objectives (DQOs) process was used to define the type, quantity and quality of the data needed to support decisions relating to the environmental condition of a site. Details of the DQO process adopted for the soil sampling and analysis program is provided in **Appendix D**.

6.1 SAMPLING PROGRAM

The sampling program was undertaken by Stephen McCormack and Sally Gartland in September 2024 and the work comprised:

- The excavation of twenty-one shallow testpits (TP1 to TP21) in accessible areas across the site, and
- The collection of soil samples from each testpit for selective laboratory analysis of contaminants of potential concern.

6.1.1 Testpit Excavation and Logging

GEE notes that the minimum number of sampling points recommended for adequate site characterisation for the site area is 8 as defined by the NSW EPA (reference 10). However, GEE used twenty-one sampling points.

Each testpit was advanced to a maximum depth of 0.2m or prior refusal on sandstone bedrock which was present at relatively shallow depths across the site and also exposed at the surface in some areas. The testpits were positioned in accordance with an approximate systematic sampling pattern across accessible areas of the site and where soil was present.

The testpits were hand dug using a shovel with care taken to avoid sampling soil that had been in contact with the shovel. Notwithstanding this, the shovel was decontaminated prior to use and between testpits by washing with laboratory grade, biodegradable and phosphate-free detergent, followed by rinsing with potable water.

To check the adequacy of the decontamination procedure, GEE collected a rinsate quality control sample (SG260924-R) from the shovel and submitted it for analysis of some contaminants of concern, in particular volatile contaminants which are most likely to cause cross-contamination.

During sampling, the soil profile was geologically logged by an environmental scientist and/or geotechnical engineer, taking care to describe the presence and depth of anthropogenic inclusions and adverse aesthetics such as discolouration, odours or obvious evidence of contamination. There was no adverse odour or staining observed during sampling, and no other obvious indicators of contamination such as ACM. However, there was sporadic evidence of paint flecks observed on the surface in parts of the site (refer to Plate 17 above for an example). Following sampling, the testpits were backfilled.

A summary of the subsurface conditions encountered is provided in Section 6.1.2, while the locations of the testpits are shown on **Figure 2** along with a recent aerial photograph.

6.1.2 Subsurface Conditions

The material encountered within the testpits, typically comprised fine to coarse SAND (sometimes with or trace fine to coarse gravel/shell fragments, and sometimes trace paint flecks), silty SAND / sandy SILT (fine to coarse grained, sometimes with or trace fine to coarse gravel, trace fine to medium shell fragments, and sometimes trace paint flecks), and silty CLAY topsoil (TP16 and TP17 within the garden bed). The shallow soil profile was underlain by sandstone bedrock and as previously mentioned, sandstone bedrock was also visible at the surface in some parts of the site.

A summary of the subsurface conditions, as observed in our testpits, is provided in **Table 2**.

Table 2: Summary of the Subsurface Conditions

Description	Location
Silty SAND / Sandy SILT: brown / dark brown, fine to coarse grained, sometimes with or trace rootlets, sometimes with or trace fine to coarse sandstone gravel and cobbles and trace paint flecks.	TP1 – TP11, TP13, TP14, TP18
SAND: yellow brown / brown, fine to coarse grained, sometimes trace rootlets, sometimes with or trace fine to coarse sandstone gravel and cobbles.	TP12, TP15, TP19-21
FILL/Topsoil – Silty CLAY: Dark brown, with rootlets and fine-grained sand, trace fine unknown gravel.	TP16 and TP17

Note 1: Bedrock was also visible at the surface across the site.

6.1.3 Soil Sampling

In accordance with NEPM (1999) Schedule B(2) *Guideline on Site Characterisation* (reference 3) samples were collected from the surface (0 – 0.15 m). Given the relatively shallow depth to bedrock, no deeper samples were collected.

Each sample was collected by hand using dedicated, disposable nitrile gloves in general accordance with techniques described in Australian Standard AS4482.2 (reference 11) and NEPM (2013 – reference 3), to maintain the representativeness and integrity of the samples. The soil was then placed in laboratory supplied; acid washed glass jars. When collecting duplicates, samples to be analysed for volatiles were not mixed, rather they were split and placed directly into separate sample jars.

Field screening of samples for the potential presence of volatile contaminants, such as fuel, was not carried out, however, there was no obvious hydrocarbon odour noted during the fieldwork and most samples were analysed for volatile component of Total Recoverable Hydrocarbons (TRH), which is more conclusive than field screening with a PID. Furthermore, based on the site history information, volatile contaminants were unlikely to be present.

The samples were each labelled with a unique sample identification number, in addition to the date of collection and project number, before being placed on ice within an esky. At the end of sampling, the esky was returned directly to the laboratory (with a Chain of Custody (COC) form).

In accordance with AS4482.1 (reference 10), a series of Quality Assurance (QA) procedures were integrated within the sampling plan and included:

- ◊ The collection of Quality Control (QC) samples.
- ◊ The use of standardised field sampling forms developed by GEE.
- ◊ Documentation of calibration and use of field instruments.

QC samples were collected as appropriate including blind replicates and split duplicates at a frequency of 5 %, and the collection of trip blanks, trip spikes and a Rinsate sample. More detail about the QC sampling and analysis is provided in Section 7 and **Appendix E**.

At the completion of each testpit, including brief logging and the sampling of soils, each testpit was backfilled with soil cuttings. A summary of the samples collected and analysed during this investigation and the sampling depths are provided in **Table 3**.

6.2 *Analytical Program*

In accordance with the CSM, selected soil samples were analysed for a broad suite of potential contaminants, including:

- ◊ Metals (Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Mercury and Zinc)
- ◊ TRH
- ◊ BTEXN
- ◊ PAH
- ◊ OCPs
- ◊ OPPs
- ◊ PCBs
- ◊ Asbestos.

Select samples were also analysed for pH and Cation Exchange Capacity to assist with determining the appropriate ecological assessment criteria. The primary environmental samples were analysed by Envirolab laboratory in Chatswood which is National Association of Testing Authorities (NATA) registered for the testing undertaken. The secondary (or inter laboratory) samples were analysed by Envirolab Melbourne laboratory which is also NATA registered for the testing undertaken.

A summary of the soil analytical program, including which samples were selected for analysis and the chemicals analysed, is provided in **Table 3**.

Table 3: Summary of the Sampling and Analysis Program

Location	Sample Depth (m)	Sample ID	Material Type/Layer	Analytical Program						
				Metals	TRH/ BTEXN	PAHs	OCPs	OPPs	PCBs	Asbestos
Primary Samples										
TP1	0 – 0.15	SG260924-01	Silty SAND	✓	✓	✓	✓	-	✓	✓
TP2	0 – 0.15	SG260924-02	Silty SAND	✓	-	-	✓	✓	-	✓
TP3	0 – 0.15	SG260924-03	Silty SAND	✓	✓	✓	✓	-	✓	✓
TP4	0 – 0.15	SG260924-04	Silty SAND	✓	-	-	✓	✓	-	✓
TP5	0 – 0.15	SG260924-05	Silty SAND	✓	✓	✓	✓	-	✓	✓
TP6	0 – 0.15	SG260924-06	Silty SAND	✓	-	-	✓	✓	-	✓
TP7	0 – 0.15	SG260924-07	Silty SAND	✓	✓	✓	✓	-	✓	✓
TP8	0 – 0.15	SG260924-08	Silty SAND	✓	✓	✓	✓	-	✓	✓
TP9	0 – 0.15	SG260924-09	Silty SAND	✓	✓	✓	✓	-	✓	✓
TP10	0 – 0.15	SG260924-10	Silty SAND	✓	✓	✓	✓	-	✓	✓
TP11	0 – 0.15	SG260924-11	Silty SAND	✓	-	-	✓	✓	-	✓
TP12	0 – 0.15	SG260924-12	SAND	✓	✓	✓	✓	-	✓	✓
TP13	0 – 0.15	SG260924-13	Silty SAND	✓	-	-	✓	✓	-	✓
TP14	0 – 0.15	SG260924-14	Silty SAND	✓	-	-	✓	✓	-	✓
TP15	0 – 0.15	SG260924-15	SAND	✓	✓	✓	✓	-	✓	✓
TP16	0 – 0.15	SG260924-16	Silty CLAY with sand	✓	-	✓	✓	✓	-	✓
TP17	0 – 0.15	SG260924-17	Silty CLAY with sand	✓	-	✓	✓	✓	-	✓
TP18	0 – 0.15	SG260924-18	Silty SAND	✓	-	✓	-	-	-	-
TP19	0 – 0.15	SG260924-19	SAND	✓	-	-	-	-	-	-

TP20	0 – 0.15	SG260924-20	SAND	✓	-	✓	-	-	-	-
TP21	0 – 0.15	SG260924-21	SAND	✓	-	✓	-	-	-	-
		TOTALS		21	9	14	17	8	9	17
			Quality Control Samples							
TP1	0 – 0.15	SG260924-100	Blind Replicate of SM041023-01	✓	✓	✓	✓	-	✓	-
TP15	0 – 0.15	SG260924-101	Split Duplicate of SM041023-15	✓	✓	✓	✓	-	✓	-
--	--		Trip Blank	-	✓[1]		-	-	-	-
--	--		Trip Spike	-	✓[2]		-	-	-	-
--	--		Rinsate Sample SG260924-R	✓	✓		-	-	-	-

Note 1: TRH Volatile and BTEXN Only

Note 2: BTEXN Only

7 DATA QUALITY ASSESSMENT

A detailed Quality Assurance (QA) assessment, including the analysis of Quality Control (QC) samples, was carried out by GEE to determine the suitability and reliability of field procedures and analytical results. In accordance with Appendix C of Schedule B2 of the NEPM (reference 3), the QA assessment used Data Quality Indicators (DQIs) which included:

- ◊ precision.
- ◊ accuracy (or bias).
- ◊ representativeness.
- ◊ completeness.
- ◊ comparability.

The detailed QA assessment report is provided in **Appendix E** and concludes that the field procedures and analytical data presented herein are of suitable quality for making conclusions and recommendations regarding the contamination status of the site.

8 ASSESSMENT CRITERIA

To determine the significance of any contaminants detected in the soil samples, appropriate Site Assessment Criteria (SAC) have been defined and are based on guidelines endorsed by the NSW EPA.

For any soil contamination assessment, it is necessary to assess the human health and ecological risks associated with the presence of site contamination. Also, in accordance with the NSW EPA Site Auditor Guidelines (reference 8) and section 3.6 of Schedule B1 of the NEPM (reference 12), recreational sites need to address aesthetics such as highly malodorous soils or soils with geotechnical issues.

Furthermore, in accordance with the NEPM (2013), *Schedule B(1) – Guidelines on Investigation Levels for Soil and Groundwater* (reference 13), no single summary statistic will fully characterise a site and appropriate consideration of relevant statistical measurements should be used in the data evaluation process.

For soil to be considered as uncontaminated (i.e. not posing an unacceptable risk) all reported concentrations must be below the site remediation criteria. For chemical analysis the following statistical criteria shall be adopted with respect to the health criteria:

- The upper 95% confidence limit on the average concentration for each analyte (calculated for samples collected from consistent soil horizons, stratigraphy or material types) must be below the adopted criterion,
- No single concentration shall exceed 250% of the adopted criterion, and
- The standard deviation of the results must be less than 50% of the criterion.

8.1 AESTHETICS

Aesthetics were continually assessed in the field during sampling and no significant observations were noted.

8.2 ECOLOGICAL RISK

The site and surrounding area comprises public open space with coastal vegetative communities, supporting ecology that relies on transitional areas between the ocean and land. The area surrounding the site (South Head) is one of seven terrestrial precincts that comprise Sydney Harbour National Park, made up of remnant natural vegetation including grassland and low heath at the edges of the plateau that the site sites on, with higher vegetation towards the centre. Most of the surrounding land has been zoned as National

Parks and Nature Reserves since 1977 and is of relatively high conservation value. Therefore, ecological criteria are relevant.

To address potential ecological risks for the site, GEE has compared the soil analytical results against the Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) appropriate for the residential land-use as detailed in NEPM (2013), *Schedule B(1) – Guidelines on Investigation Levels for Soil and Groundwater* (reference 13).

8.2.1 Ecological Investigation Levels (EILs)

EILs were derived for common contaminants in soil (specifically Arsenic, Copper, Chromium (III), DDT, naphthalene, Nickel, Lead and Zinc) and are based on a species sensitivity distribution (SSD) model developed for Australian conditions. They consider the physicochemical properties of soil (e.g. Cation Exchange Capacity, pH and clay content), contaminants and the capacity of the local ecosystem to accommodate increases in contaminant levels (referred to as the 'added contaminant limit' or ACL) above ambient background. Also, EILs consider various land use scenarios and generally only apply to the top 2m of soil profile that will be exposed by the proposed development.

Finally, different EILs apply for 'fresh' contamination and 'aged' contamination. 'Fresh' contamination is usually associated with current activity and chemical spills, while a contaminant that has been incorporated into a soil for more than 2 years is considered to be 'aged'. For the purpose of this report 'aged' EILs have been adopted because any contamination present at the site is likely to have been present for more than 2 years.

To assist with determining appropriate EILs to screen the soil analytical results, particularly for Copper, Chromium -III, Nickel and Zinc, the pH and Cation Exchange Capacity (CEC) of the soil was analysed for all sample locations. The pH ranged from 6.4 to 8.2 and the CEC ranged from 1.5 meq/100g to 23 meq/100g. For the purpose of this report, and to screen the analytical results, GEE has adopted the lowest pH value of 6.4 and the lowest CEC value of 1.5 meq/100g. Additionally, a value of conservative 5% clay composition has been adopted when determining the EIL for chromium (III) and a conservative 1% Organic Carbon has been adopted when determining the EIL for copper, nickel and zinc.

When determining the EILs for Copper, Nickel, Chromium and Zinc, ambient background concentrations can be used to increase the final EIL, however, as a preliminary assessment of the analytical results, zero ambient background concentrations have been adopted. If exceedances occur, then GEE will consider actual pH, CEC values and potential background levels as part of our discussion of the results later in this report.

The broad land-use scenarios are:

- ◊ Areas of ecological significance,
- ◊ Urban residential / public space, and
- ◊ Commercial/industrial.

Each land-use scenario assumes different exposure scenarios and are generally based on the primary land-use activity of any exposed soils remaining following redevelopment. Given that the site is used for recreation purposes and public space then this is considered to be appropriate. GEE notes that the South Head peninsula is within a National Park and so "areas of ecological significance" could apply but that is usually associated with undeveloped National Parks and this Peninsula is developed.

A summary of the EILs appropriate for the site is provided in **Table 4**.

8.2.2 Ecological Screening Levels (ESLs)

ESLs have been developed for selected petroleum hydrocarbon compounds (specifically TRH[3], BTEX and Benzo(a)pyrene) and are applicable for assessing risk to terrestrial ecosystems. ESLs broadly apply to coarse and fine-grained soils and like EILs the ESLs consider various land use scenarios, only apply to the top 2m of soil and differ for 'fresh' contamination and 'aged' contamination. For this report, 'aged' ESLs have been adopted, and coarse-grained soil was adopted over fine-grained soil because it is the most dominant soil type.

With respect to land-use, areas of ecological significance ESLs have been adopted for the same reason as the EILs.

A summary of the ESLs appropriate for the site is provided in **Table 4.** GEE notes that screening levels are the concentrations of a contaminant above which will require further evaluation and consideration.

8.3 HEALTH RISK

To address potential health impacts at the site, GEE has compared the analytical results against Health Investigation Levels (HILs) and Health Screening Levels (HSLs), provided in NEPM (2013), *Schedule B(1) – Guidelines on Investigation Levels for Soil and Groundwater* (reference 12).

[3] ESLs for the various carbon fractions are based on TRH analysis with F1 (C6-C9) being obtained after subtraction of BTEX.

8.3.1 Health Investigation Levels (HILs)

HILs for soil contaminants are provided in Table 1A(1) of the NEPM guidelines and have been developed for a broad range of metals and organic substances (i.e. PAHs, Pesticides and PCBs). Asbestos and petroleum hydrocarbons are not included.

The HILs are scientifically based, generic assessment criteria to be used as a first stage (or tier 1) screening of potential risks to human health from chronic exposure to contaminants. They are intentionally conservative and are based on the following four different and generic land use scenarios (or exposure scenarios) which are based on long-term exposures for the most sensitive receptor populations exposed:

- HIL-A described as residential with accessible soils and includes childcare centres, preschools and primary schools,
- HIL-B which includes residential with minimal opportunities for soil access and includes high rise apartments,
- HIL-C for public space such as parks and secondary schools, and
- HIL-D for commercial/industrial sites.

Each land-use scenario assumes different exposure scenarios and when land is used for more than one purpose, the HILs that are relevant to the more sensitive land-use should be adopted. The most appropriate land use scenario for the site is HIL-C.

A summary of the HIL-C criteria is provided in **Table 4**.

8.3.2 Health Screening Levels (HSLs)

Health Screening Levels (HSLs) were developed for selected petroleum hydrocarbons (specifically TRH C_6 – C_{10} or F1 fraction, TRH >C_{10} – C_{16} or F2 fraction and BTEX) by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) and have been adopted and are referenced in Schedule B(1) of NEPM (2013 – reference 12) and Friebel & Nadebaum (2011 – reference 13). HSLs were also developed for asbestos in soil by the WA DoH (reference 14) and have been adopted in Schedule B(1) of NEPM.

Petroleum Hydrocarbons

The assessment of petroleum hydrocarbon contamination is primarily driven by human health concerns relating to:

1. Volatile components (e.g., TRH $C_6 - C_{10}$, TRH $>C_{10} - C_{16}$ and Benzene) which have the potential to cause health issues via vapour intrusion (e.g., from inhalation), and
2. Direct contact with the hydrocarbons.

For vapour intrusion, different HSLs apply for different land use scenarios, different soil types (i.e. sand, silt and clay) and different depths. For the purpose of this investigation, criteria relevant for shallow (0m to 1m) soils has been adopted because they are the most conservative and all of the samples collected for analysis were from less than 1m depth. For soil type, the criteria for sand soils have been adopted because this is the most conservative and most common soil type encountered. Notwithstanding this, if a sample exceedance occurs then the corresponding criteria will be considered during discussion of the analytical results.

With respect to land-use, there are five scenarios:

◊ HSL-A for low density residential sites

◊ HSL-B for high density residential sites

◊ HSL-C for recreational/open space areas

◊ HSL-D for commercial and industrial sites

◊ HSL – Intrusive Maintenance Workers

For the site, HSL-C is most applicable.

For direct contact, which is also appropriate for the site, different HSLs apply for various land-use scenarios and the most appropriate for this site are those relating to HSL-C.

In summary, and for the purpose of a preliminary assessment of the results, GEE has adopted the lowest criteria from the HSLs for vapour intrusion (HSL-C), and HSLs for direct contact (HSL-C). Like HILs, an exceedance of the HSL does not necessarily mean that there is a risk, rather further appropriate evaluation and/or investigation is required. A summary of the HSLs adopted for the site is provided in **Table 4**.

Asbestos is Soil

GEE has adopted a zero-tolerance approach to asbestos in soil and therefore any detection of asbestos fibres will result in the need for further assessment and/or management.

Table 4: Soil Site Assessment Criteria (SAC)

Analyte	Health Investigation/Screening Levels (HILs/HSLs) (mg/kg)	Reference	Ecological Investigation/Screening Levels (EILs/ESLs)	Reference
Total Metals				
Arsenic	300	(HIL-C) Table 1A – Reference 13	100	(EIL) Table 1B(5) – Reference 13
Cadmium	90	(HIL-C) Table 1A – Reference 13	--	--
Chromium (VI)	300	(HIL-C) Table 1A – Reference 13	--	--
Chromium (III)	--	--	320	(EIL) Table 1B(3) – Reference 13
Copper	17,000	(HIL-C) Table 1A – Reference 13	45	(EIL) Table 1B(2) – Reference 13
Lead	600	(HIL-C) Table 1A – Reference 13	1,100	(EIL) Table 1B(5) – Reference 13
Mercury (inorganic)	80	(HIL-C) Table 1A – Reference 13	--	--
Nickel	1,200	(HIL-C) Table 1A – Reference 13	7	(EIL) Table 1B(3) – Reference 13
Zinc	30,000	(HIL-C) Table 1A – Reference 13	170	(EIL) Table 1B(1) – Reference 13
Polycyclic Aromatic Hydrocarbons (PAHs)				
Benzo(a)pyrene	--	--	0.7	(EIL) Table 1B(6) – Reference 13
Benzo(a)pyrene TEQ	3	(HIL-C) Table 1A – Reference 13	--	--
TOTAL PAHs	300	(HIL-C) Table 1A – Reference 13	--	--
Organochlorine Pesticides (OCP) and Organophosphate Pesticides (OPP)				
Heptachlor	10	(HIL-C) Table 1A – Reference 13	--	--
Aldrin + Dieldrin	10	(HIL-C) Table 1A – Reference 13	--	--
Endrin	20	(HIL-C) Table 1A – Reference 13	--	--
Chlordane	70	(HIL-C) Table 1A – Reference 13	--	--
Endosulfan	340	(HIL-C) Table 1A – Reference 13	--	--
HCB	10	(HIL-C) Table 1A – Reference 13	--	--
Methoxychlor	400	(HIL-C) Table 1A – Reference 13	--	--
DDE + DDD + DDT	400	(HIL-C) Table 1A – Reference 13	--	--
DDT	--	--	180	(EIL) Table 1B(5) – Reference 13
Chlorpyrifos	160	(HIL-A) Table 1A – Reference 17	--	--
BTEXN				
Benzene	120	(HSL-C direct contact) Table A4 – Reference 14	50	(ESL) Table 1B(6) – Reference 13
Toluene	18,000	(HSL-C direct contact) Table A4 – Reference 14	85	(ESL) Table 1B(6) – Reference 13
Ethylbenzene	5,300	(HSL-C direct contact) Table A4 – Reference 14	70	(ESL) Table 1B(6) – Reference 13
Xylenes	15,000	(HSL-C direct contact) Table A4 – Reference 14	105	(ESL) Table 1B(6) – Reference 13
Naphthalene	1,900	(HSL-C direct contact) Table A4 – Reference 14	170	(EIL) Table 1B(5) – Reference 13
Total Recoverable Hydrocarbons (TRH)				
(F1) C6 – C10	5,100	(HSL-C direct contact) Table A4 – Reference 14	180	(ESL) Table 1B(6) – Reference 13
(F2) >C10 - C16	3,800	(HSL-C direct contact) Table A4 – Reference 14	120	(ESL) Table 1B(6) – Reference 13
(F3) >C16 – C34	5,300	(HSL-C direct contact) Table A4 – Reference 14	300	(ESL) Table 1B(6) – Reference 13
(F4) >C34 – C40	7,400	(HSL-C direct contact) Table A4 – Reference 14	2,800	(ESL) Table 1B(6) – Reference 13
PCBs				
Total PCBs	1	(HIL-C) Table 1A – Reference 10	-	-
Asbestos				
Asbestos – surface and buried	No Visible Asbestos	--	-	-

9 ANALYTICAL RESULTS

A copy of the laboratory reports is provided in **Appendix F**, while a summary of the results is provided in **Table 5** and discussed in the following Sections.

9.1 METALS

Each of the 21 primary samples were analysed during this investigation for arsenic, cadmium, copper, lead, nickel, mercury and zinc. In summary, the following samples had concentrations that exceeded either the ecological and/or health-based SAC:

Analyte	Number of Surface Samples with Concentrations Exceeding Ecological-Based SAC	Number of Surface Samples with Concentrations Exceeding Human-Based SAC
Copper	Nine (9) - TP2, TP3, TP4, TP5, TP6, TP8, TP9, TP11 and TP13	-
Lead	Eight (8) - TP2, TP3, TP4, TP5, TP6, TP8, TP9 & TP13	Thirteen (13) - TP2, TP3, TP4, TP5, TP6, TP8, TP9, TP10, TP11, TP12, TP13, TP14 & TP19
Nickel	Five (5) – TP3, TP5, TP6, TP9 & TP20	-
Zinc	Nineteen (19) – TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP16, TP17, TP18, TP19 & TP20	-

Further consideration of the significance of these exceedances for the proposed development is provided in Section 10.4.1.

9.2 BTEXN

A total of 9 primary samples were selected for BTEXN analysis and the concentrations were less than the adopted ecological and health-based SAC as well as the laboratory LOR. These results indicate that BTEXN are not a contamination issue at the site.

9.3 TRH

A total of 9 primary samples were selected for TRH analysis. In summary, the sample concentrations were all below the corresponding health-based SAC, while 3 samples (TP3, TP5 and TP8) had concentrations of TRH >C10 - C16 (F2) and/or >C16-C34 (F3) above the corresponding ecological-based SAC.

Further consideration of the significance of these exceedances are provided in Section 10.4.2.

9.4 PAHs

A total of 14 primary soil samples were analysed for PAHs, which includes Benzo(a)Pyrene (BaP) and BaP Toxicity Equivalent Quotient (BaP TEQ). In summary, 8 of the samples (TP1, TP3, TP5, TP7, TP8, TP10, TP15 and TP17) from across the site had concentrations of beBaP above the corresponding ecological-based SAC, while one of these samples (TP17) had a concentration of BaP TEQ above the corresponding health-based SAC.

Further consideration of the significance of these exceedances are provided in Section 10.4.3.

9.5 OCPs AND OPPs

A total of 17 primary samples were analysed for OCPs, and 8 for OPPs. In summary, the concentrations of all OCPs and OPPs were less than the adopted SAC and the minimum laboratory detection limits.

9.6 PCBs

A total of 9 primary soil samples were analysed for PCBs and the concentrations were less than the adopted ecological and health-based SAC as well as the laboratory LOR. These results indicate that PCBs are not a contamination issue at the site.

9.7 ASBESTOS

The presence of asbestos fibres was inspected in 17 surface samples which are most likely to be impacted by asbestos. Asbestos fibres were not detected in each of the samples.

TABLE 5 - Summary of the Soil Analytical Results

Analyte	Units	Limit Of Reporting (LOR)	Sample ID	SG260924-01	SG260924-100	SG260924-02	SG260924-03	SG260924-04	SG260924-05	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10	SG260924-11	Site Acceptance Criteria	
			Location	TP1	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP9	TP10	TP11	Health Based Criteria (HILs & HSLs)	Ecological Based Criteria (EILs & ESLs)
			Depth	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15		
			Type	Silty SAND	Blind Replicate of SM041023-01	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND		
Asbestos ID Soil																	
Asbestos ID	g/kg	0.1g/kg (0.01%)		<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.01%**	-
Trace Analysis [2]	Yes/No	-		No	-	No	No	No	No	No	No	No	No	No	No	**0.001%**	-
Lab Comment [3]	-	-		Not Visible	-	Not Visible	Not Visible	Not Visible	Not Visible	Not Visible	Not Visible	Not Visible	Not Visible	Not Visible	Not Visible	-	-
Metals																	
Arsenic	mg/kg	4		<4	<4	<4	8	<4	<4	5	<4	<4	5	<4	<4	**300**	**100**
Cadmium	mg/kg	0.4		<0.4	<0.4	1	4	0.8	1	3	<0.4	1	0.8	<0.4	<0.4	**90**	-
Chromium[1]	mg/kg	1		7	7	7	45	18	23	270	4	8	15	7	11	**300**	**320**
Copper	mg/kg	1		24	21	97	440	270	200	420	42	110	180	41	57	**17,000**	**45**
Lead	mg/kg	1		190	160	**1200**	**12000**	**2800**	**4100**	**14000**	400	**4100**	**2000**	**1100**	**920**	**600**	**1,100**
Mercury	mg/kg	0.1		0.1	0.1	0.3	2.6	0.7	3.8	6.8	<0.1	0.2	0.9	0.2	0.2	**80**	-
Nickel	mg/kg	1		6	6	4	16	6	9	140	1	3	9	3	2	**1,200**	**7**
Zinc	mg/kg	1		210	190	730	11000	2400	2300	9600	180	2200	1300	470	750	**30,000**	**170**
BTEXN																	
Benzene	mg/kg	0.2		<0.2	<0.2	-	<0.2	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	-	**120**	**50**
Toluene	mg/kg	0.5		<0.5	<0.5	-	<0.5	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	-	**18,000**	**85**
Ethylbenzene	mg/kg	1		<1	<1	-	<1	-	<1	-	<1	<1	<1	<1	-	**5,300**	**70.0**
Total Xylenes	mg/kg	1		<1	<1	-	<1	-	<1	-	<1	<1	<1	<1	-	**15,000**	**105**
Naphthalene	mg/kg	1		<1	<1	-	<1	-	<1	-	<1	<1	<1	<1	-	**1,900**	**17**
TRH																	
TRH C_6 - C_{10} (F1)	mg/kg	25		<25	<25	-	<25	-	<25	-	<25	<25	<25	<25	-	**5,100**	**180**
TRH >C_{10} - C_{16} (F2)	mg/kg	50		<50	<50	-	290	-	55	-	<50	<50	<50	<50	-	**3,800**	**120**
TRH >C_{16}-C_{34} (F3)	mg/kg	100		240	150	-	1100	-	660	-	160	330	200	270	-	**5,300**	**300**
TRH >C_{34}-C_{40} (F4)	mg/kg	100		100	100	-	450	-	290	-	<100	160	140	130	-	**7,400**	**2,800**
PAHs																	
Benzo(a)pyrene	mg/kg	0.05		1.9	0.77	-	0.9	-	1.7	-	0.75	0.86	0.52	1	-	-	**0.7**
Benzo(a)pyrene TEQ	mg/kg	0.5		2.8	1.1	-	1.3	-	2.7	-	1.1	1.3	0.8	1.5	-	**3**	-
Total PAHs	mg/kg	0.05		36	9.2	-	12	-	23	-	10	12	6	16	-	**300**	-
OCPs																	
Heptachlor	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**10**	-
Aldrin	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**10**	-
Dieldrin	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Endrin	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**20**	-
gamma-Chlordane	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**70**	-
alpha-chlordane	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Endosulfan I	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**340**	-
Endosulfan II	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
HCB	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**10**	-
Methoxychlor	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**400**	-
DDE + DDD + DDT	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**400**	-
DDT	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	**180**
Remaining OCPs	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
OPPs																	
Chlorpyrifos	mg/kg	0.1		-	-	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	**160**	-
Remaining OPPs	mg/kg	0.1		-	-	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	-
PCBs																	
Total PCBs	mg/kg	0.1		<0.1	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	-	**1**	-
Other Tests																	
pH	pH Units	0.1		6.9	-	7.1	8.1	7.9	8.1	8.2	7.9	7.9	7	7.9	7.9	-	-
CEC	meq/100g	1		9.5	-	17	16	8.4	6.6	12	1.8	5.8	10	4	5	-	-

TABLE NOTES:

Analytical results which exceed any of the Health-based Investigation Levels (HILs) are shown as **bold** text. And Sheded Red

Analytical results for samples within the upper 2m which exceed any of the Ecological-based Investigation Levels (EILs) are shown as boxed text.

1 – Total Chromium analytical result includes chromium (III) and (VI).

TABLE 5 - Summary of the Soil Analytical Results

Analyte	Units	Limit Of Reporting (LOR)	Sample ID	SG260924-12	SG260924-13	SG260924-14	SG260924-15	SG260924-101	SG260924-16	SG260924-17	SG260924-18	SG260924-19	SG260924-20	SG260924-21	Site Acceptance Criteria	
			Location	TP12	TP13	TP14	TP15	TP15	TP16	TP17	TP18	TP19	TP20	TP21	Health Based Criteria (HILs & HSLs)	Ecological Based Criteria (EILs & ESLs)
			Depth	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15		
			Type	SAND	Silty SAND	Silty SAND	SAND	Split Duplicate of SM041023-15	Silty SAND	Silty SAND	Silty SAND	SAND	SAND	SAND		
Asbestos ID Soil																
Asbestos ID	g/kg	0.1g/kg (0.01%)		<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	-	-	-	**0.01%**	-
Trace Analysis [2]	Yes/No	-		No	No	No	No	-	No	No	-	-	-	-	**0.001%**	-
Lab Comment [3]	-	-		Not Visible	Not Visible	Not Visible	Not Visible	-	Not Visible	Not Visible	-	-	-	-	-	-
Metals																
Arsenic	mg/kg	4		<4	7	<4	<4	<4	<4	<4	<4	<4	<4	<4	**300**	**100**
Cadmium	mg/kg	0.4		<0.4	0.7	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	<0.4	<0.4	**90**	-
Chromium[1]	mg/kg	1		4	10	9	7	5.1	6	8	8	7	8	4	**300**	**320**
Copper	mg/kg	1		35	1100	32	13	30	45	41	19	38	19	4	**17,000**	**45**
Lead	mg/kg	1		**610**	**2000**	**660**	88	270	430	590	170	**850**	170	13	**600**	**1,100**
Mercury	mg/kg	0.1		0.1	0.5	0.3	<0.1	<0.1	0.2	0.3	<0.1	0.3	0.1	<0.1	**80**	-
Nickel	mg/kg	1		1	5	6	5	3.4	4	4	5	2	9	<1	**1,200**	**7**
Zinc	mg/kg	1		370	1900	530	110	230	300	640	220	560	190	8	**30,000**	**170**
BTEXN																
Benzene	mg/kg	0.2		<0.2	-	-	<0.2	<0.2	-	-	-	-	-	-	**120**	**50**
Toluene	mg/kg	0.5		<0.5	-	-	<0.5	<0.5	-	-	-	-	-	-	**18,000**	**85**
Ethylbenzene	mg/kg	1		<1	-	-	<1	<1	-	-	-	-	-	-	**5,300**	**70.0**
Total Xylenes	mg/kg	1		<1	-	-	<1	<3	-	-	-	-	-	-	**15,000**	**105**
Naphthalene	mg/kg	1		<1	-	-	<1	<1	-	-	-	-	-	-	**1,900**	**17**
TRH																
TRH C_6 - C_{10} (F1)	mg/kg	25		<25	-	-	<25	<25	-	-	-	-	-	-	**5,100**	**180**
TRH >C_{10} - C_{16} (F2)	mg/kg	50		<50	-	-	<50	<50	-	-	-	-	-	-	**3,800**	**120**
TRH >C_{16}-C_{34} (F3)	mg/kg	100		<100	-	-	140	<100	-	-	-	-	-	-	**5,300**	**300**
TRH >C_{34}-C_{40} (F4)	mg/kg	100		100	-	-	<100	<100	-	-	-	-	-	-	**7,400**	**2,800**
PAHs																
Benzo(a)pyrene	mg/kg	0.05		0.1	-	-	1.1	0.48	0.52	2.5	0.5	-	0.2	<0.05	-	**0.7**
Benzo(a)pyrene TEQ	mg/kg	0.5		<0.5	-	-	1.6	0.64	0.8	**3.7**	0.7	-	<0.5	<0.5	**3**	-
Total PAHs	mg/kg	0.05		1.5	-	-	11	5.8	6	27	6.4	-	1.8	<0.05	**300**	-
OCPs																
Heptachlor	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	**10**	-
Aldrin	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	**10**	-
Dieldrin	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-		
Endrin	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	**20**	-
gamma-Chlordane	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	**70**	-
alpha-chlordane	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-		
Endosulfan I	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	**340**	-
Endosulfan II	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-		
HCB	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	**10**	-
Methoxychlor	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	**400**	-
DDE + DDD + DDT	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	**400**	-
DDT	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	**180**
Remaining OCPs	mg/kg	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-
OPPs																
Chlorpyrifos	mg/kg	0.1		-	<0.1	<0.1	-	-	<0.1	<0.1	-	-	-	-	**160**	-
Remaining OPPs	mg/kg	0.1		-	<0.1	<0.1	-	-	<0.1	<0.1	-	-	-	-	-	-
PCBs																
Total PCBs	mg/kg	0.1		<0.1	-	-	<0.1	<0.1	-	-	-	-	-	-	**1**	-
Other Tests																
pH	pH Units	0.1		8.1	7.3	6.9	6.5	-	7.8	7.2	6.7	6.4	6.4	6.8	-	-
CEC	meq/100g	1		3.1	5.3	7.1	5.6	-	23	18	11	9.4	9.8	1.5	-	-

TABLE NOTES:

Analytical results which exceed any of the Health-based Investigation Levels (HILs) are shown as **bold** text. And Sheded Red

Analytical results for samples within the upper 2m which exceed any of the Ecological-based Investigation Levels (EILs) are shown as boxed text.

1 – Total Chromium analytical result includes chromium (III) and (VI).

10 SITE CHARACTERISATION

A summary of the investigation is presented below and includes a review of the analytical results.

10.1 SITE HISTORY

The Site / Investigation Area

The historical information indicates that the Hornby Lighthouse was built in 1858 following the catastrophic wrecking of two ships (the Dunbar and Catherine Adamson) approximately two months apart, both attempting to enter Port Jackson in 1857. The name of the Lighthouse was derived from the name of the Commander-in-Chief of the British Pacific Fleet (and the father-in-law of Governor Denison), Sir Phipps Hornby.

The construction date of the Lighthouse pre-dates the use of Asbestos Containing Material (ACM), although lead based paints may have been used. Therefore, any renovations, maintenance, or the demolition of these structures, may have resulted in near surface soils being impacted with lead and/or ACM.

Surrounding Land

The historical aerial photographs revealed that the surrounding land within ~150m of the site was predominantly undeveloped in the earliest available photograph from 1930. Notable exceptions were two Lightkeepers cottages located to the west of the site, with the cottage furthest to the west having been constructed at the same time as the Lighthouse in 1958. Extensions and repairs were carried out on this cottage in 1860 and at this time the second cottage located immediately to the west of the Lighthouse was constructed. Further additions were made to these cottages in 1877 and each cottage had an underground tank stored water for general use. The cottages were not connected to mains city water until 1897.

Although only visible in the 1943 photograph, there were likely other smaller structures present pre-1930, including the small concrete enclosure / lookout located immediately to the north of the site and some circular fortification pits. Over time there was various changes to the built environment in the surrounding area, including alterations and additions to the houses west of the site, construction of new buildings to the south associated with the HMAS Watson Navy base, the sealing of roads and the construction of pedestrian trails. Additionally, vegetation cover (trees and shrubs) in the area west, south-west and south of the site noticeably increased between 1994 and 2006.

Surrounding land and land-use activities have the potential to cause contamination of the site via groundwater or vapour migration. However, the historical information did not reveal any evidence of significant contaminating activities associated with the surrounding land.

10.2 Site Description and Surface Conditions

The site is located on the north-eastern end of South Head peninsula (which is a part of Sydney Heads) and can be found along the South Head Heritage trail, a popular scenic and historical trail which provides views of Sydney Harbour to the west, Middle Head and North Head to the north, and the Tasman Sea (part of the South Pacific Ocean) to the east.

The lighthouse features distinctive red and white stripes and is situated close to the edge of the plateau, a few metres away from the eastern sandstone cliff line. There is an engineered sandstone wall surrounding the north-eastern part of the lighthouse, providing a barrier between the cliff edge and the lighthouse.

Gun emplacement pits can be seen in the immediate vicinity of the lighthouse (to the south), as well as the two lightkeepers' cottages to the west (separated from the main path by gardens). The concrete enclosure / lookout structure to the north of the lighthouse was present, however, access to the public had been prevented with fencing barriers and signage.

There was a concrete pavement (part of the South Head Heritage trail) to the west of the lighthouse (running in a North to South direction) and between the pavement and the fence of the lightkeepers' cottage there were garden beds comprising grasses, ground cover, shrubs and small trees (providing a barrier and privacy screening between the lightkeepers' cottage and public path).

At the time of our inspection, the ground surface comprised a mix of exposed sandstone bedrock, grass covered area, and exposed surface soils. In the immediate vicinity of the lighthouse, white flecks of paint (ranging from ~1 mm to ~15 mm) could be seen on the surface of exposed surface soils.

Importantly, during our site walkover inspection there was no unusual odours or surface staining that could be potentially associated with contamination. There was also no evidence of under-ground or above-ground, fuel or chemical, storage tanks observed across the site. Additionally, there was no obvious evidence of Asbestos Containing Materials (ACM) on the surface of the site.

10.3 Potential For Contamination

Based on GEE's knowledge of the site, including review of the site's history and physical and environmental setting, the main sources of potential contamination included the following:

Fill Material: There is potential for fill material to have been introduced to site to raise the site surface or create a level building platform for past and present infrastructure. When sourced from an unknown origin, the quality of the fill not known and therefore may be contaminated. This would also apply to any waste debris identified elsewhere across the site.
Lead based paint: The age of the existing lighthouse suggests that lead based paints may have been used. Therefore, weathering / degradation, any renovations, maintenance of the structures may have resulted in near surface soils being impacted with lead.
Potential Pesticide Use: There is potential for the use of pesticides to manage vegetation around the lighthouse.
Past and Present Vehicle Movements: Vehicles accessing and parking on site may have resulted in leaks and spillage of fuel and oils.

It was also determined that the potential for contamination is from top-down sources and therefore the potential contaminated media is the surface soils. To a lesser extent is the deeper soil profile, where present, because there is always potential for contaminants at the surface to leach down through the soil profile.

Groundwater was not considered to be contaminated media given that it is likely to be present at significant depth (>10m) and confined within the sandstone bedrock formation. Soil vapour is also not a contaminated media given the lack of volatile CoPC.

10.4 Subsurface Soil Conditions

Soil conditions across the site were assessed at twenty-one testpit locations (**Figure 2**) positioned in accessible locations across the site. The number of testpits exceeds the minimum number of sampling points required for adequate site characterisation as defined by the EPA NSW (reference 9).

The site stratigraphy, as observed in the shallow testpits typically comprised Silty SAND or SAND over sandstone bedrock which was present at relatively shallow depths across the

site (and also exposed at the surface in some areas). During the hand digging of the shallow testpits and the sampling of soil across the site, there were no adverse odours or staining observed. Additionally, there was no Asbestos Containing Materials (ACM) observed. However, there was sporadic evidence of paint flecks observed on the surface in parts of the site (refer to Plate 17 above for an example).

To assess the contamination status of the topsoil, fill and natural soil profile across the site, GEE submitted a total of 21 primary soil samples to a NATA accredited laboratory analysis for analysis of the CoPC. Specifically, metals (arsenic, cadmium, chromium, copper, nickel, lead, mercury and zinc), TRH, BTEXN, PAHs, OCPs, OPPs, PCBs and asbestos fibres. As a preliminary screening of the results, the analytical results were compared against relevant set of health-based SAC appropriate for the land-use (i.e. recreational open space and areas of ecological significance).

In summary, there were a number of surface samples across the site that contained concentrations of metals (including chromium, copper, lead, nickel and zinc), TRH and/or PAHs above the preliminary ecological-based SAC and/or the health-based SAC. Further assessment and consideration of these exceedances are provided in the following sub-sections.

10.4.1 Metal Exceedances

The analytical results were below the corresponding SAC except for:

- The following thirteen (13) samples which had concentrations of lead that exceeded the health-based SAC:
  - SG260924-02
  - SG260924-03
  - SG260924-04
  - SG260924-05
  - SG260924-06
  - SG260924-08
  - SG260924-09
  - SG260924-10
  - SG260924-11
  - SG260924-12
  - SG260924-13

- SG260924-19

◊ The following twenty samples which had concentrations of copper, lead, nickel and/or zinc above the ecological based SAC:

- SG260924-01
- SG260924-02
- SG260924-03
- SG260924-04
- SG260924-05
- SG260924-06
- SG260924-07
- SG260924-08
- SG260924-09
- SG260924-10
- SG260924-11
- SG260924-12
- SG260924-13
- SG260924-14
- SG260924-15
- SG260924-16
- SG260924-17
- SG260924-18
- SG260924-19
- SG260924-20

Health-based Exceedance

These thirteen lead health-based HIL exceedances varied in concentration from 610mg/kg to 14,000mg/kg and the calculated 95% UCL for this dataset, when calculated using ProUCL version 5.1 (reference 17) is 7426mg/kg, while the standard deviation is 4407mg/kg. Given the high concentrations involved, including the fact that 7 of the 13 sample results were more than 250% of the EIL, GEE considers the soil at these locations require remediation to ensure there is no risk to future users of the site. The locations

where the lead concentration exceeded the health-based SAC is shown in **Figure 3** along with the proposed extent of remediation required.

Ecological-based Exceedances

The soil samples which had concentrations of lead above the ecological criteria of 1,100mg/kg were from TP2, TP3, TP4, TP5, TP6, TP8, TP9, and TP13 and the concentrations also exceeded the health-based criteria as detailed above and therefore requires remediation.

With respect to the other metal exceedances of copper nickel and zinc, and as mentioned in Section 8.2.1, the EILs consider the physicochemical properties of soil (e.g. Cation Exchange Capacity, pH and clay content) and the capacity of the local ecosystem to accommodate increases in contaminant levels (referred to as the 'added contaminant limit' or ACL) above ambient background.

For the pH and CEC values, the lowest values from all the samples was adopted (i.e. 6.4 pH and 1.5 meq/100g). Additionally, a zero ambient background concentration was adopted.

The actual CEC and pH results for these samples are as follows:

Sample ID	Actual pH value	Actual CEC (meq/100g)
SG260924-01	6.9	9.5
SG260924-02	7.1	17.0
SG260924-03	8.1	16.0
SG260924-04	7.0	8.4
SG260924-05	8.1	6.6
SG260924-06	8.2	12.0
SG260924-07	7.9	1.8
SG260924-08	7.9	5.8
SG260924-09	7.0	10.0
SG260924-10	7.9	4.0
SG260924-11	7.9	5.0
SG260924-12	8.1	3.1
SG260924-13	7.3	5.3
SG260924-14	6.9	7.1

SG260924-16	7.8	23.0
SG260924-17	7.2	18.0
SG260924-18	6.7	11.0
SG260924-19	6.4	9.4
SG260924-20	6.4	9.8

When using the actual CEC and pH values for each sample, the corresponding EILs (or ecological SAC) increases as indicated below:

Sample ID	Location	Sample Concentration (mg/kg)	Actual Ecological SAC
Copper (preliminary ecological SAC = 45 mg/kg)			
SG260924-02	TP2	97	220
SG260924-03	**TP3**	**440**	**220**
SG260924-04	**TP4**	**270**	**180**
SG260924-05	**TP5**	**200**	**140**
SG260924-06	**TP6**	**420**	**210**
SG260924-08	TP8	110	130
SG260924-09	TP9	180	210
SG260924-11	TP11	57	110
SG260924-13	**TP13**	**1,100**	**120**
Nickel (preliminary ecological SAC = 7 mg/kg)			
SG260924-03	TP3	16	230
SG260924-05	TP5	9	65
SG260924-06	TP6	140	190
SG260924-09	TP9	9	170
SG260924-20	TP20	9	160
Zinc (preliminary ecological SAC = 170 mg/kg)			
SG260924-01/100	TP1	210/190	460
SG260924-02	**TP2**	**730**	**690**
SG260924-03	**TP3**	**11,000**	**660**
SG260924-04	**TP4**	**2,400**	**430**
SG260924-05	**TP5**	**2,300**	**370**
SG260924-06	**TP6**	**9,600**	**540**
SG260924-07	TP7	180	180

SG260924-08	**TP8**	**2,200**	**340**
SG260924-09	**TP9**	**1,300**	**480**
SG260924-10	**TP10**	**470**	**270**
SG260924-11	**TP11**	**750**	**310**
SG260924-12	**TP12**	**370**	**240**
SG260924-13	**TP13**	**1,900**	**320**
SG260924-14	**TP14**	**530**	**380**
SG260924-15	TP15	110/230	330
SG260924-16	TP16	300	850
SG260924-17	TP17	640	720
SG260924-18	TP18	220	510
SG260924-18	**TP19**	**560**	**510**
SG260924-20	TP20	190	470

When using the actual CEC and pH values, there remained some samples which had concentrations of copper and zinc above the adjusted criteria and require remediation and/or management. GEE notes that these sample locations are the same as those which had concentrations of lead above the health-based SAC and/or ecological-based SAC.

10.4.2 TRH Exceedances

The analytical results were below the corresponding health-based SAC, while the following three samples had concentrations of TRH-F2 and/or TRH-F3 above the corresponding ecological-based SAC:

Sample ID	**Location**	**Sample Concentration**
TRH-F2 (ecological SAC = 120 mg/kg)		
SG260924-03	TP3	290
TRH-F3 (ecological SAC = 300 mg/kg)		
SG260924-03	TP3	1,100
SG260924-05	TP5	660
SG260924-06	TP6	330

It is likely that these results are influenced by elevated PAHs in the same samples and silica-gel cleanup testing could have been completed to confirm the actual petroleum hydrocarbon component of the sample results. However, each of these sample locations correspond to elevated lead concentrations which require remediation. In this regard, additional testing was not warranted.

10.4.3 PAH Exceedances

The analytical results were below the corresponding SAC except for those listed below:

Sample ID	**Location**	**Sample Concentration**
BaP TEQ Health Based SAC 3mg/kg		
SG260924-17	TP17	3.7
BaP TEQ Ecological Based SAC 0.7mg/kg		
SG260924-01/100	TP1	1.9/0.77
SG260924-03	TP3	0.9
SG260924-05	TP5	1.7
SG260924-07	TP7	0.75
SG260924-08	TP8	0.86
SG260924-10	TP10	1.0
SG260924-15/101	TP15	1.1/0.48
SG260924-17	TP17	2.5

Ecological Based SAC Exceedances

GEE notes that the ecological-based SAC for benzo(a)pyrene in the NEPC guidelines (reference 13) is based on Canada's Soil Quality Guidelines of 1999 (reference 21). However, these guidelines were superseded in 2010 (reference 20) and their new criteria is 20mg/kg for residential use and parklands. The updated criteria incorporate more toxicological data and therefore is considered more reliable. Based on this revised assessment criteria, there are no exceedances meaning there is no ecological risk present from the site.

Health Based SAC Exceedances

The single health-based SAC exceedance from TP17 was 3.7mg/kg which was marginally above the criteria of 3.0mg/kg.

To further assess the significance of the exceedance, and in accordance with NSW EPA Sampling Design Guidelines (reference 10) and NEPM (1999) Schedule B(2) *Guideline on Site Characterisation* (reference 4), GEE has calculated the 95% Upper Confidence Limit (UCL) of BaP TEQ concentrations using all the data from the fill layer found across the site. The 95% UCL of the arithmetic mean provides a 95% confidence level that the true population mean will be less than, or equal to, this value.

In this instance, there were 14 separate results in total in the data set and calculations were undertaken using the ProUCL (Version 5.1) statistical software package (reference 17) which provides calculations for a variety of data set distributions.

The data distribution appeared to be distributed normally and ProUCL recommended that the 95% Students-t UCL calculation be adopted which resulted in a concentration of 1.88mg/kg which below the health-based SAC. The data was also noted as having a lognormal distribution and the corresponding 95% UCL when using the equations suited to lognormal distributions were also below the SAC with the highest result being 2.18mg/kg. A copy of the 95% UCL Data sheet is provided in **Appendix G**.

In summary, when considering the 95% UCL result and expected exposure duration/frequency, the elevated Bap TEQ concentration does not pose a significant risk to human health and no further assessment or remediation for BaP TEQ is not warranted.

10.5 GROUNDWATER ASSESSMENT

GEE acknowledges that groundwater conditions beneath the site were not assessed as part of this investigation. However, this is acceptable given that:

- ◊ The contaminants of concern are from top-down sources,
- ◊ The regional groundwater in the vicinity of the site is confined or partly confined, discrete, water-bearing zones within the underlying sandstone bedrock formation,
- ◊ The bedrock formation of sandstone is expected to have a relatively low permeability (in the order of 10^{-7}m/sec – reference 15) and would restrict the vertical migration of contaminants, and
- ◊ There have been no significant volatile contaminating activities identified during this preliminary investigation which could be sufficiently mobile and impact the groundwater.

11 CONCLUSION AND RECOMMENDATIONS

Geo-Environmental Engineering Pty Ltd (GEE) was commissioned by the Port Authority of New South Wales to undertake a preliminary and detailed site contamination investigation at Hornby Lighthouse, South Head Heritage Trail, Watsons Bay New South Wales 2030 (herein referred to as the 'site'). The allotment in which the lighthouse has been constructed covers an area of approximately 1,000m^2, and is legally identified Lot 415 in Deposited Plan (DP) 752011. As much of the eastern and north-eastern part of this allotment comprises an exposed sandstone cliffline which is rugged and relatively inaccessible, the area which was the subject of our investigation (referred to as the investigation area) covers an area of approximately 700m^2 and is legally identified as Part Lot 415 DP752011 and Part Lot 1 DP605078.

The investigation follows the recent refurbishment of the Lighthouse and was requested to supplement a Targeted Contamination Investigation that was completed by JMB Environmental Consulting (JMB) in 2023 (reference 1) which had identified surface soils around the Lighthouse that had been impacted by Lead, and to a lesser extent Zinc, at concentrations in excess of those permissible for the proposed land-use, and which could impact the current and future users of the site.

The investigation was required to better define the extent and type of contamination, and to address the requirements of Chapter 4 of the *State Environmental Planning Policy (Resilience and Hazards) 2021* (reference 2).

The investigation comprised a:

- ◊ Review of the site's history to provide an understanding of past and present site activities which in turn may indicate sources and areas of potential contamination as well as potential chemicals of concern,
- ◊ Review of the environmental and physical setting in which the site lies,
- ◊ Detailed site inspection for potential sources of contamination,
- ◊ Preparation of an initial Conceptual Site Model (CSM), and
- ◊ Detailed soil sampling and analysis program to characterise potential contamination across the site.

Based on observations made during the field investigations, the sampling and analysis program conducted at the site, the proposed land-use and with respect to relevant statutory guidelines, GEE conclude that there exists concentrations of metals (specifically, lead, copper and zinc) and to a lesser extent TRH, within the relatively shallow soil profile

above the ecological and/or health-based site assessment criteria appropriate for the current and future land-use, and therefore will require remediation. The area requiring management and/or remediation is shown on **Figure 3**.

In conclusion, the site is not currently considered to be suitable for the existing land-use. However, the site can be made suitable for the proposed development by undertaking convention management and/or remediation measures. In accordance with State and local planning guidelines a Remedial Action Plan (RAP) will be required to detail the proposed remediation methodology.

12 GENERAL LIMITATIONS OF THIS REPORT

This report has been prepared in general accordance with guidelines endorsed by the NSW Environment Protection Authority (EPA), and the conclusions of this report are based on a limited scope of work described herein, which was considered appropriate based on the same regulatory guidelines.

It is the intention of GEE that the report reflect actual subsurface site conditions, and the contamination status, of the entire site (within the depths investigated). However, regardless of the level of investigation undertaken, there will always be uncertainty when dealing with land contamination. For instance, the sampling points (boreholes and/or testpits) represent a relatively small portion of the site, and ground conditions may vary between sampling locations. The cause of such variation may include, but are not limited to, complex geological settings, the fate and transport characteristics of certain chemicals, the distribution of existing contamination, physical limitations imposed by the location of utilities and other man-made structures, and the limitations of assessment technologies.

Furthermore, the laboratory analytical results contained in this report, upon which conclusions are drawn, relate only to a discrete sample submitted for analysis. Also, not all chemicals have been assessed as part of this investigation. The chemical analytes targeted by this investigation are based on either the site's history or represent a suite of common soil contaminants.

This report is based on site conditions which existed at the time of the field investigation and subsurface conditions may change over time, either through natural processes, or via ongoing activities on the site. Should additional information become available regarding conditions at the site (such as during construction), including evidence of previously unknown sources of contamination, then additional advice should be sought from GEE.

Finally, this report has been prepared for use by the client who has commissioned the works in accordance with the project brief only. Any reliance assumed by third parties on this report shall be at their own risk. This report should not be reproduced without prior approval by the client or amended in any way without prior approval by GEE.

13 REFERENCES

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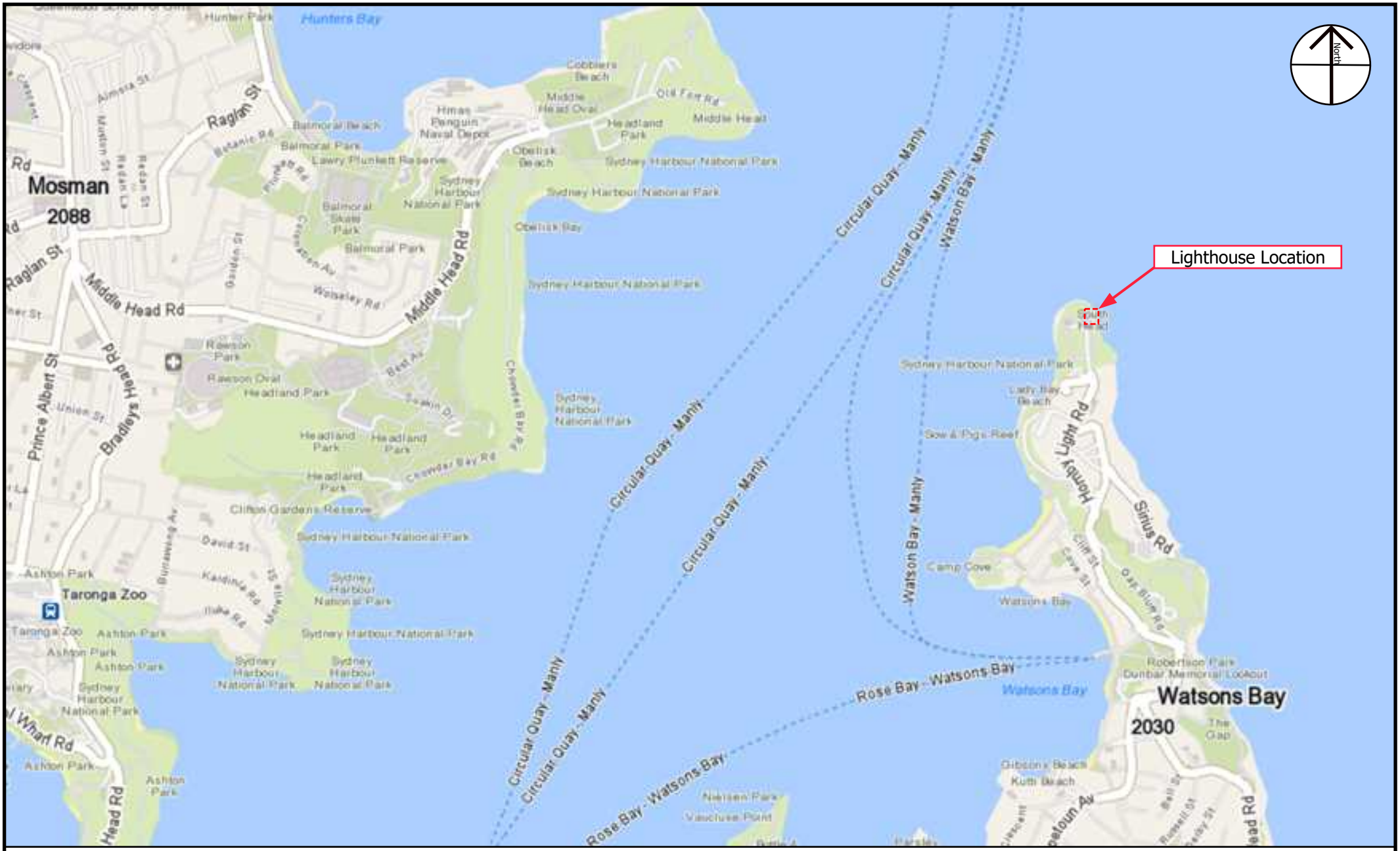
FIGURES



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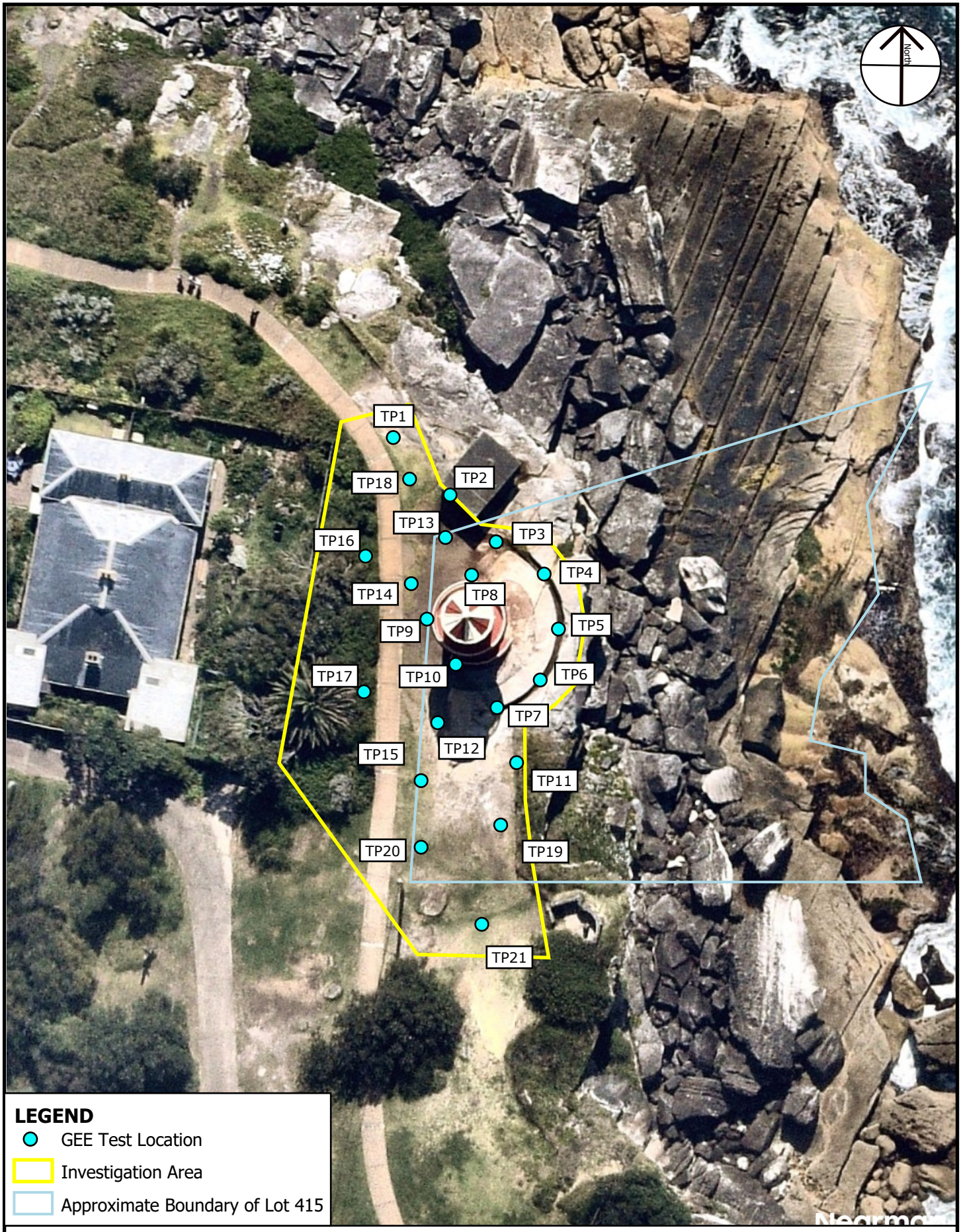
geo-environmental ENGINEERING
UNIT 2 / 5 - 7 MALTA STREET
FAIRFIELD EAST NSW 2165
P - 61 (2) 9420 3361
E - info@geoenvironmental.com.au
www.geoenvironmental.com.au

TITLE:	SCALE:	DATE:	FIGURE No.:
LOCATION MAP Hornby Lighthouse, Watsons Bay NSW	N.T.S	26 Sept 2024	1
	DRAWN: S. McC	JOB No.: G24017WB	REVISION: A



Aerial Image provided by Nearmap (https://www.nearmap.com/au/en) - Image Dated 14th September 2024

DRAWN:	SCALE:	JOB No.:	DATE:	REVISION:	FIGURE No.:
S. Gartland	N.T.S	E24017WB	23 Sept 2024	A	2

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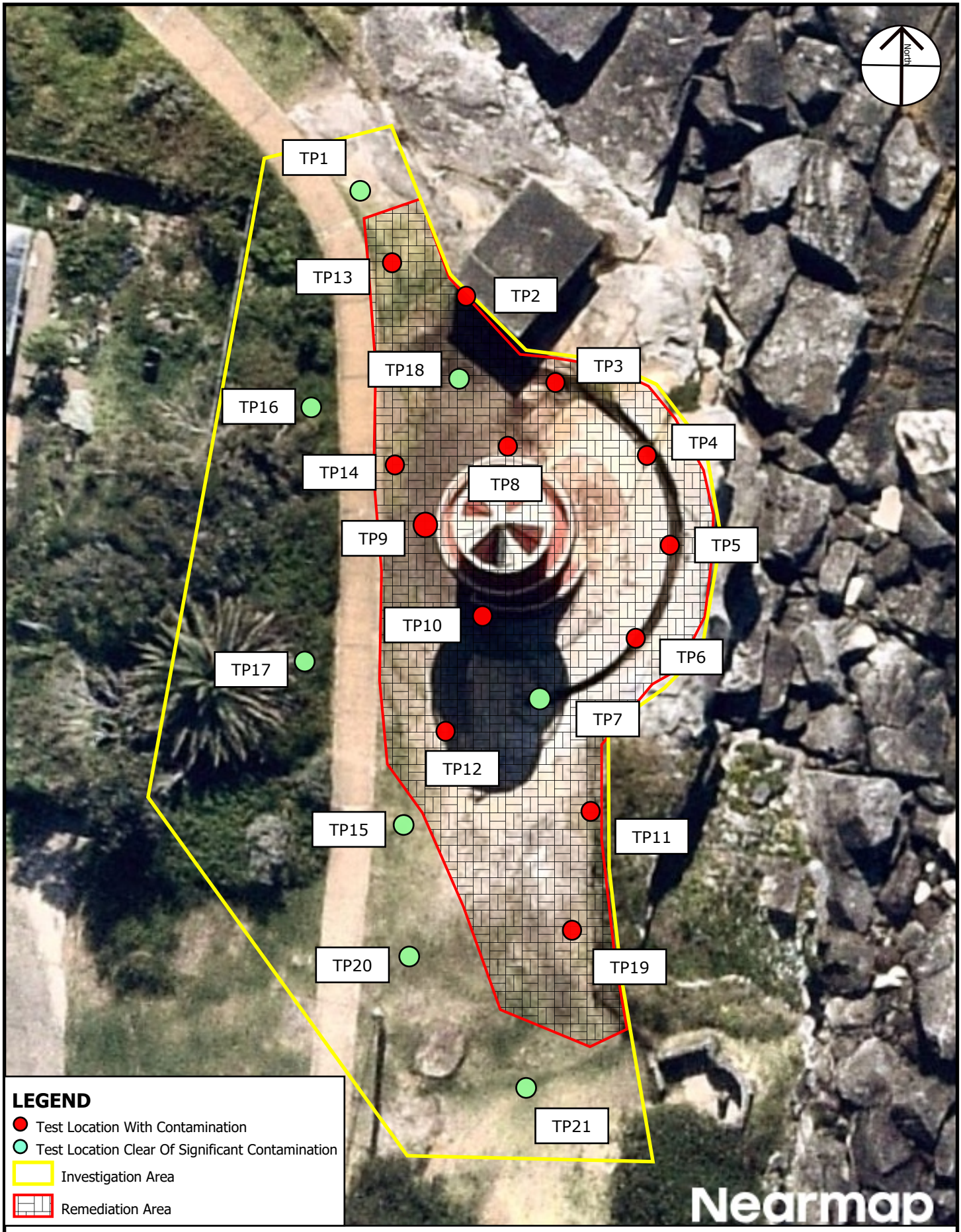
UNIT 2 / 5 - 7 MALTA STREET
FAIRFIELD EAST NSW 2165
P - 61 (2) 9420 3361
E - info@geoenvironmental.com.au
www.geoenvironmental.com.au

TITLE:

SITE PLAN

HORNBY LIGHTHOUSE
WATSONS BAY NSW



Aerial Image provided by Nearmap (https://www.nearmap.com/au/en) - Image Dated 14th September 2024

DRAWN:	SCALE:	JOB No.:	DATE:	REVISION:	FIGURE No.:
S. Gartland	**N.T.S**	**E24017WB**	**18 Oct 2024**	**A**	**3**

geo-environmental ENGINEERING
UNIT 2 / 5 - 7 MALTA STREET
FAIRFIELD EAST NSW 2165
P - 61 (2) 9420 3361
E - info@geoenvironmental.com.au
www.geoenvironmental.com.au

TITLE:

REMEDIATION AREA

APPENDIX A

JMB Environmental Consulting Targeted Contamination Investigation

PROJECT DETAILS

CLIENT	Puch Construction and Building
CONTACT	Steven Cliff
SITE ADDRESS	Hornby Lighthouse, Sydney Harbour National Park, Watsons Bay NSW 2030
LEAD SURVEYOR	George Barlow
ASSISTED BY	Vincent Seng

SCOPE OF WORKS

JMB Environmental Consulting Pty Ltd (JMBEC) were commissioned by Puch Construction and Building to conduct a targeted asbestos sampling inspection of Hornby Lighthouse, located in Sydney Harbour National Park, Watsons Bay NSW 2030.

The inspection was conducted on 14/09/2023, and the report issued on 27/09/2023.

JMBEC were engaged to conduct a thorough inspection of Hornby Lighthouse. During the inspection it was noted that due to the nature of the solid structure and the deterioration of internal timber flooring, intrusive inspections were impractical to complete.

Soil samples were also taken from surrounding external areas with the aim of ascertaining the backgorund levels of heavy metal and/or asbestos contamination prior to planned refurbishment works taking place. Please note that at the request of the client, soil samples were taken to the surface only as an indicator of potential contamination prior to any future planned works.

SUMMARY OF POSITIVE MATERIALS

No asbestos containing materials were identified within the scope of this investigation.

No asbestos was identified within the soil samples taken within the scope of this investigation.

Out of the five soil samples collected, three soil samples taken for background contaminant levels for the contaminants of concern (heavy metals) returned results above the criteria for HIL-C (public open space), and EIL/ESL's for Urban residential and public open space as stated within the National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013).

The samples with elevated results; TP03 (North of the lighthouse), TP04 – (North-East of the lighthouse) and TP05 (South-East of the lighthouse), were taken where the terrain slopes downwards, indicating contaminants in run off.

TP04 & TP05 were both taken from the trench on the eastern elevation, which at the time of inspection, contained high levels of standing water. It is therefore prudent to assume that the higher levels recorded in that location when compared to TP01 & TP02 are a direct factor of water run off during rainfall.

The remaining soil samples (TP01 & TP02) were confirmed to have concentrations below the applicable HIL-C, EIL/ESL criteria for the nominated contaminants of concern.

For the summary of soil sample results for metals, please refer to Table 1.

CONCLUSIONS

There is some areas of elevated metals results in the soils around the lighthouse that exceed the adopted criteria for the site. These elevated concentrations may be a result of historical run off from the building and surface coatings and are to act as an indicator of potential site contamination.

A register of the materials sampled, associated photographs, NATA accredited lab certificates and site plan can be found in the latter part of this report. Any limited or no access areas will also be presented in the register.

Please note, this inspection was not a full building survey. As such, many of the components of a survey report, such as sampling methodology, risk assessment details and control actions have been omitted, but are available on request. Where applicable, any positive asbestos materials identified in this sampling report should be added to the current Asbestos Building Register.

DOCUMENT CONTROL

DOCUMENT NO.	DATA ENTRY		APPROVED & AUTHORISED	
	DATE	PERSONNEL	DATE	PERSONNEL
J23092914092023TSR	25/09/2023	Vanessa Riley	27/09/2023	Alex Buchanan

PREVIOUS DOCUMENTATION

N/A

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This report was produced by:
Company: JMB Environmental Consulting Pty Ltd
Address: 15/77-79 Bourke Road Alexandria NSW 2015
Phone no.: (02) 8339 0312
Email: admin@jmbec.com.au

SAMPLING REGISTER

Table 1 - Summary of heavy metals in soil results

Sample ID	Sample Date	Priority Metals (mg/kg)							
		As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
J230929255 TP01	14/9/2023	2	<0.3	7	17	180	5	190	0.1
J230929255 TP02	14/9/2023	3	<0.3	9	24	310	5	310	0.1
J230929255 TP03	14/9/2023	3	<0.3	8	82	1,500	1	570	0.4
J230929255 TP04	14/9/2023	<1	<0.3	6	58	740	5	290	1
J230929255 TP05	14/9/2023	3	0.4	10	90	1,400	4	920	0.4
Maximum Result		**3**	**0.4**	**10**	**90**	**1,500**	**5**	**920**	**1**
Health Investigation Level-C (Recreational / Open Space)		**300**	**90**	**300**	**17,000**	**600**	**1,200**	**30,000**	**80**
Health Screening Level-C (Recreational / Open Space)		**N/C**	**N/C**	**N/C**	**N/C**	**N/C**	**N/C**	**N/C**	**N/C**
Ecological Investigation Levels/ Ecological Screening Levels (Urban Residential and Public Open Space)		**110**	**N/C**	**200**	**210**	**1,200**	**175**	**480**	**N/C**

KEY	
	Exceeds Health Investigation Level-C (Recreational / Open Space) Criteria
	Exceeds Ecological Investigation Levels/ Ecological Screening Levels Criteria (Urban Residential and Public Open Space)
	NEPM Criteria met
ND	Not Detected
N/C	No Criteria

Table 2 - Summary of heavy metals in paint results

Sample ID	Location Description	Sample Date	Priority Metals (% w/w)		
			Arsenic, As	Chromium, Cr	Lead, Pb
J230929255 LP1	Undercoat - Red - Various Topcoats	14/9/2023	<0.0025	0.002	0.31
J230929255 LP2	Topcoat - Brown	14/9/2023	<0.0025	0.014	**3.90**
		Limit for all surfaces	**N/C**	**N/C**	**0.5**

KEY	
	Exceeds Criteria
ND	Not Detected
N/C	No Criteria

Table 3 - Sampling Register

EXTERNAL - GF - PERIMETER

SPECIFIC LOCATION	MATERIAL	HAZARD	REF #	EXTENT	FRIABLE?	RESULT	OVERALL RISK	ACTION CODE	TIME FRAME	COMMENTS	PHOTO #
GF Perimeter Mortar lines	Mortar	Asbestos	J230929255A3	. Throughout Building	Non-Friable	NAD,ORG	-	-	-	-	1
GF Perimeter North of lighthouse	Soil	Heavy Metal	J230929255TP 03	. Throughout Area	Not Applicable	Arsenic, As - 3mg/kg, Cadmium, Cd - <0.3mg/kg, Chromium, Cr - 7.5mg/kg, Copper, Cu - 82mg/kg, Lead, Pb - 1500mg/kg, Mercury, Hg - 0.39mg/kg, Nickel, Ni - 1.3mg/kg, Zinc, Zn - 570mg/kg	-	-	n/a	Sample taken from approximately 1.5 meters away from the lighthouse base	2
GF Perimeter North-east of the lighthouse - within the run offf	Soil	Heavy Metal	J230929255TP 04	. Throughout Area	Not Applicable	Arsenic, As - <1mg/kg, Cadmium, Cd - <0.3mg/kg, Chromium, Cr - 5.9mg/kg, Copper, Cu - 58mg/kg, Lead, Pb - 740mg/kg, Mercury, Hg - 1.2mg/kg, Nickel, Ni - 4.7mg/kg, Zinc, Zn - 290mg/kg	-	-	n/a	-	3
GF Perimeter South east of the lighthouse - within the run off	Soil	Heavy Metal	J230929255TP 5	. Throughout Area	Not Applicable	Arsenic, As - 3mg/kg, Cadmium, Cd - 0.4mg/kg, Chromium, Cr - 10mg/kg, Copper, Cu - 90mg/kg, Lead, Pb - 1400mg/kg, Mercury, Hg - 0.42mg/kg, Nickel, Ni - 4.2mg/kg, Zinc, Zn - 920mg/kg	-	-	n/a	-	4
GF Perimeter South of lighthouse	Soil	Heavy Metal	J230929255TP 01	. Throughout Area	Not Applicable	Arsenic, As - 2mg/kg, Cadmium, Cd - <0.3mg/kg, Chromium, Cr - 6.9mg/kg, Copper, Cu - 17mg/kg, Lead, Pb - 180mg/kg, Mercury, Hg - 0.07mg/kg, Nickel, Ni - 5.2mg/kg, Zinc, Zn - 190mg/kg	-	-	n/a	Sample taken from approximately 7 meters away from the base of the lighthouse due to rocky terrain.	5

SPECIFIC LOCATION	MATERIAL	HAZARD	REF #	EXTENT	FRIABLE?	RESULT	OVERALL RISK	ACTION CODE	TIME FRAME	COMMENTS	PHOTO #
GF Perimeter TP01 - South of the lighthouse	Soil	Asbestos	J230929255A6	. Throughout Area	Friable	NADRL,ORG	-	-	n/a	-	6
GF Perimeter TP02 - West of the lighthouse	Soil	Asbestos	J230929255A7	. Throughout area	Friable	NADRL,ORG	-	-	n/a	-	7
GF Perimeter TP03 - North of the lighthouse	Soil	Asbestos	J230929255A8	. Throughout Area	Friable	NADRL,ORG	-	-	n/a	-	8
GF Perimeter TP04 - North east of the lighthouse	Soil	Asbestos	J230929255A9	. Throughout Area	Friable	NADRL,ORG	-	-	n/a	-	9
GF Perimeter TP05 - South east of the lighthouse	Soil	Asbestos	J230929255A10	. Throughout Area	Friable	NADRL,ORG	-	-	n/a	-	10
GF Perimeter West of lighthouse	Soil	Heavy Metal	J230929255TP2	. Throughout Area	Not Applicable	Arsenic, As - 3mg/kg, Cadmium, Cd - <0.3mg/kg, Chromium, Cr - 8.9mg/kg, Copper, Cu - 24mg/kg, Lead, Pb - 310mg/kg, Mercury, Hg - 0.1mg/kg, Nickel, Ni - 5.2mg/kg, Zinc, Zn - 310mg/kg	-	-	n/a	Sample taken from approximately 1.5 meters away from the base of the lighthouse	11
GF Perimeter Window frames - between the glass and timber	Putty	Asbestos	J230929255A1	. Throughout framework	Non-Friable	NAD,ORG	-	-	-	-	12
GF Perimeter Window frames - between the timber framework	Putty	Asbestos	J230929255A2	. Throughout Building	Non-Friable	NAD,ORG	-	-	-	-	13
GF Perimeter Window frames to the lantern room exterior	Putty	Asbestos	J230929255A5	. Throughout Framework	Non-Friable	NAD,ORG	-	-	-	-	14

INTERNAL - GF - ENTRANCE

SPECIFIC LOCATION	MATERIAL	HAZARD	REF #	EXTENT	FRIABLE?	RESULT	OVERALL RISK	ACTION CODE	TIME FRAME	COMMENTS	PHOTO #
GF Entrance Mortar lines	Mortar	Asbestos	J230929255A3.1	. Throughout Building	Non-Friable	NAD,ORG	-	-	-	-	15
GF Entrance Stairs & handrails	Topcoat - Brown	Lead Paint	J230929255LP2	. Throughout Building	Not Applicable	Arsenic, As - <0.0025% w/w, Chromium, Cr - 0.014% w/w, Lead, Pb - 3.9% w/w	Low	A1	Prior to refurbishment or demolition	-	16
GF Entrance Timber floorboards	Undercoat - Red - Various Topcoats	Lead Paint	J230929255LP1	8 m²	Not Applicable	Arsenic, As - <0.0025% w/w, Chromium, Cr - 0.002% w/w, Lead, Pb - 0.31% w/w	Low	A1	Prior to refurbishment or demolition	-	17

INTERNAL - L2 - LANTERN ROOM

SPECIFIC LOCATION	MATERIAL	HAZARD	REF #	EXTENT	FRIABLE?	RESULT	OVERALL RISK	ACTION CODE	TIME FRAME	COMMENTS	PHOTO #
L2 Lantern room Copper sheeting to the floor	Undercoat - Red - Various Topcoats	Lead Paint	J230929255LP1.1	8 m²	Not Applicable	Arsenic, As - <0.0025% w/w, Chromium, Cr - 0.002% w/w, Lead, Pb - 0.31% w/w	Low	A1	Prior to refurbishment or demolition	-	18
L2 Lantern room Mortar lines	Mortar	Asbestos	J230929255A3.2	. Throughout Building	Non-Friable	NAD,ORG	-	-	-	-	19
L2 Lantern room Stairs, handrails & lantern framework	Topcoat - Brown	Lead Paint	J230929255LP2.1	. Throughout Building	Not Applicable	Arsenic, As - <0.0025% w/w, Chromium, Cr - 0.014% w/w, Lead, Pb - 3.9% w/w	Low	A1	Prior to refurbishment or demolition	-	20
L2 Lantern room Window frames	Putty	Asbestos	J230929255A4	. Throughout Room	Non-Friable	NAD,ORG	-	-	-	-	21

INTERNAL - BASEMENT - BASEMENT

SPECIFIC LOCATION	MATERIAL	HAZARD	REF #	EXTENT	FRIABLE?	RESULT	OVERALL RISK	ACTION CODE	TIME FRAME	COMMENTS	PHOTO #
BASEMENT Basement Within the basement area	-	No Access	J230929255N A1	-	Not Applicable	Presumed to contain asbestos or hazardous materials	-	NA	Prior to demolition, refurbishment or operational access	Area remains outside the current scope of works.	22

*ACTION CODES

A1 - Restrict Access and remove under controlled conditions with licensed contractors

A2 - Remove, enclose, encapsulate or seal by licensed contractors followed by a re-inspection and maintenance schedule under a management plan. Remove prior to refurbishment or Demolition by licensed contractors

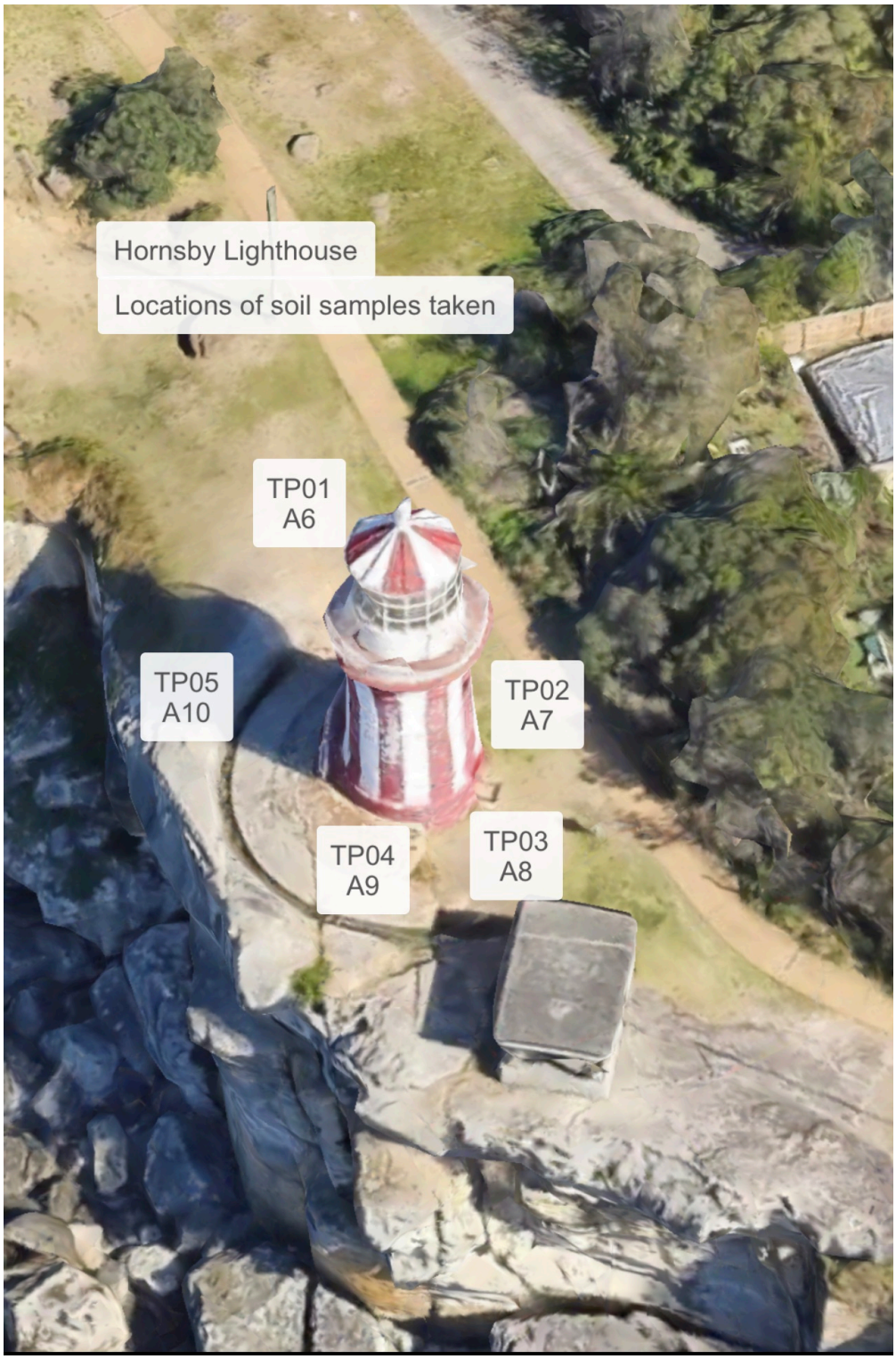
A3 - Enclose, encapsulate or seal by appropriately trained general maintenance or licensed contractors. Implement re-inspection, maintenance and demolition schedule under a management plan. Remove or protect prior to refurbishment or demolition by licensed contractors or competent individuals as required.

A4 - No remedial action required. Implement re-inspection and maintenance schedule under a management plan.

- No further action required

NA - Access to survey to be gained prior to refurbishment, demolition or modification of building materials in the area of limited or no access. In some situations, access should be provided to survey prior to occupancy if a room is inaccessible.

SITE PLAN


Hornsby Lighthouse
Locations of soil samples taken
TP01
A6
TP05
A10
TP02
A7
TP04
A9
TP03
A8

PHOTOGRAPHS

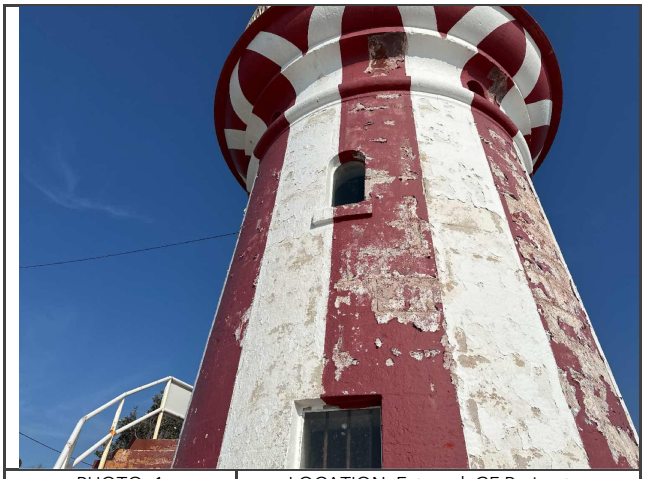


PHOTO: 1	LOCATION: External, GF Perimeter Mortar lines
MATERIAL: Mortar	RESULT: NAD,ORG

PHOTO: 2	LOCATION: External, GF Perimeter North of lighthouse
MATERIAL: Soil (heavy metal contaminants)	RESULT: Refer to Sampling Register

PHOTO: 3	LOCATION: External, GF Perimeter North-east of the lighthouse - within the run offf
MATERIAL: Soil (heavy metal contaminants)	RESULT: Refer to Sampling Register

PHOTO: 4	LOCATION: External, GF Perimeter South east of the lighthouse - within the run off
MATERIAL: Soil (heavy metal contaminants)	RESULT: Refer to Sampling Register

PHOTO: 5	LOCATION: External, GF Perimeter South of lighthouse
MATERIAL: Soil (heavy metal contaminants)	RESULT: Refer to Sampling Register

PHOTO: 6	LOCATION: External, GF Perimeter TP01 - South of the lighthouse
MATERIAL: Soil (asbestos)	RESULT: NADRL,ORG

PHOTO: 7	LOCATION: External, GF Perimeter TP02 - West of the lighthouse
MATERIAL: Soil (asbestos)	RESULT: NADRL,ORG

PHOTO: 8	LOCATION: External, GF Perimeter TP03 - North of the lighthouse
MATERIAL: Soil (asbestos)	RESULT: NADRL,ORG

PHOTO: 9	LOCATION: External, GF Perimeter TP04 - North east of the lighthouse

PHOTO: 10	LOCATION: External, GF Perimeter TP05 - South east of the lighthouse

MATERIAL: Soil (asbestos)	RESULT: NADRL,ORG

PHOTO: 11	LOCATION: External, GF Perimeter West of lighthouse
MATERIAL: Soil (heavy metal contaminants)	RESULT: Refer to Sampling Register

PHOTO: 12.1	LOCATION: External, GF Perimeter Window frames - between the glass and timber
MATERIAL: Putty	RESULT: NAD,ORG

MATERIAL: Soil (asbestos)	RESULT: NADRL,ORG

PHOTO: 12	LOCATION: External, GF Perimeter Window frames - between the glass and timber
MATERIAL: Putty	RESULT: NAD,ORG

PHOTO: 13	LOCATION: External, GF Perimeter Window frames - between the timber framework
MATERIAL: Putty	RESULT: NAD,ORG

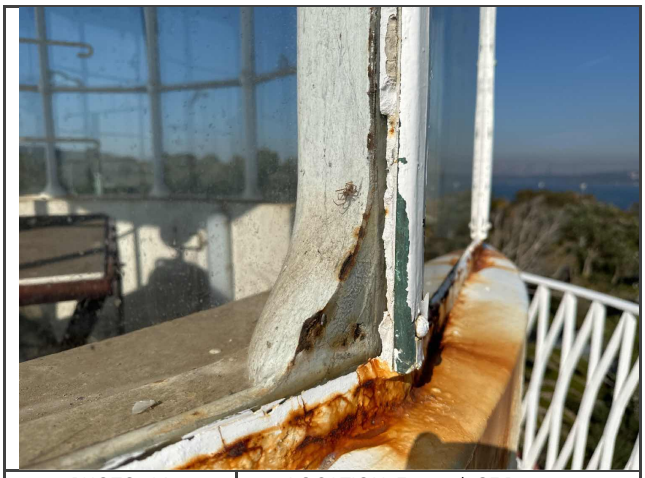


PHOTO: 14	LOCATION: External, GF Perimeter Window frames to the lantern room exterior
MATERIAL: Putty	RESULT: NAD,ORG

PHOTO: 14.1	LOCATION: External, GF Perimeter Window frames to the lantern room exterior
MATERIAL: Putty	RESULT: NAD,ORG

PHOTO: 15	LOCATION: Internal, GF Entrance Mortar lines
MATERIAL: Mortar	RESULT: NAD,ORG

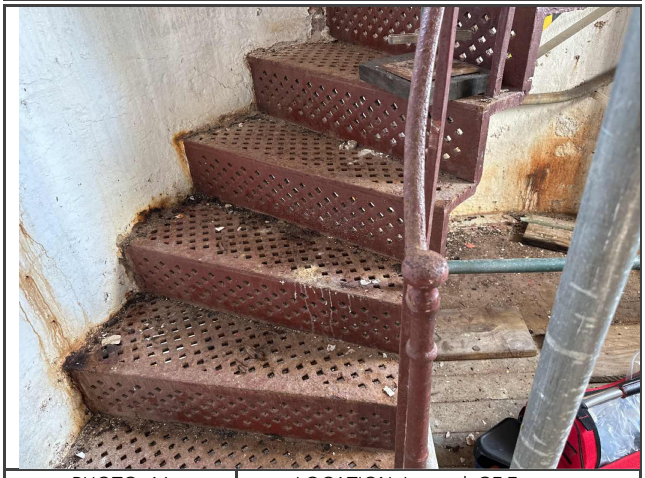


PHOTO: 16	LOCATION: Internal, GF Entrance Stairs & handrails
MATERIAL: Topcoat - Brown	RESULT: Refer to Sampling Register

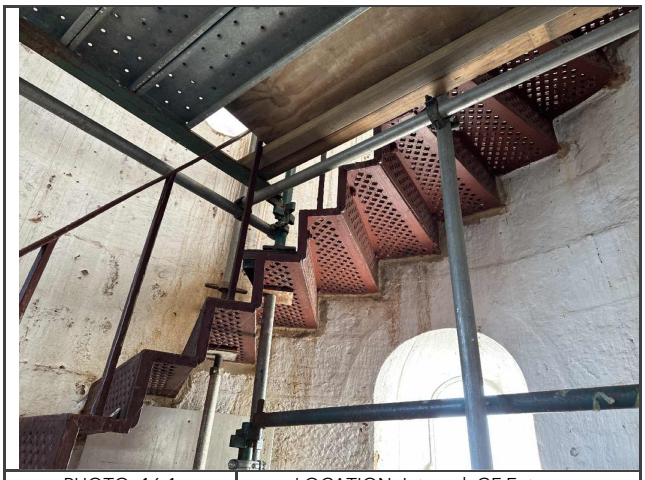


PHOTO: 16.1	LOCATION: Internal, GF Entrance Stairs & handrails
MATERIAL: Topcoat - Brown	RESULT: Refer to Sampling Register

PHOTO: 17	LOCATION: Internal, GF Entrance Timber floorboards
MATERIAL: Undercoat - Red - Various Topcoats	RESULT: Refer to Sampling Register

PHOTO: 18	LOCATION: Internal, L2 Lantern room Copper sheeting to the floor
MATERIAL: Undercoat - Red - Various Topcoats	RESULT: Refer to Sampling Register

PHOTO: 19	LOCATION: Internal, L2 Lantern room Mortar lines
MATERIAL: Mortar	RESULT: NAD,ORG

PHOTO: 20	LOCATION: Internal, L2 Lantern room Stairs, handrails & lantern framework
MATERIAL: Topcoat - Brown	RESULT: Refer to Sampling Register

PHOTO: 21	LOCATION: Internal, L2 Lantern room Window frames
MATERIAL: Putty	RESULT: NAD,ORG

LABORATORY CERTIFICATES

SGS

ANALYTICAL REPORT

ilac-MRA

NATA

Accreditation No. 2562

CLIENT DETAILS

Contact	George Barlow
Client	JMB ENVIRONMENTAL CONSULTING PTY LTD
Address	UNIT 15 77-79 BOURKE ROAD ALEXANDRIA NSW 2015
Telephone	0477 009 396
Facsimile	(Not specified)
Email	george@jmbec.com.au
Project	**J-230929**
Order Number	**J-230929**
Samples	5

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE253833 R0**
Date Received	14/9/2023
Date Reported	21/9/2023

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Dong LIANG
Metals/Inorganics Team Leader

Shane MCDERMOTT
Inorganic/Metals Chemist

SGS

ANALYTICAL RESULTS SE253833 R0

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 20/9/2023

PARAMETER	UOM	LOR	J-230929 TP01 SOIL - 14/9/2023 SE253833.001	J-230929 TP02 SOIL - 14/9/2023 SE253833.002	J-230929 TP03 SOIL - 14/9/2023 SE253833.003	J-230929 TP04 SOIL - 14/9/2023 SE253833.004	J-230929 TP05 SOIL - 14/9/2023 SE253833.005
Arsenic, As	mg/kg	1	**2**	**3**	**3**	<1	**3**
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	**0.4**
Chromium, Cr	mg/kg	0.5	**6.9**	**8.9**	**7.5**	**5.9**	**10**
Copper, Cu	mg/kg	0.5	**17**	**24**	**82**	**58**	**90**
Lead, Pb	mg/kg	1	**180**	**310**	**1500**	**740**	**1400**
Nickel, Ni	mg/kg	0.5	**5.2**	**5.2**	**1.3**	**4.7**	**4.2**
Zinc, Zn	mg/kg	2	**190**	**310**	**570**	**290**	**920**

SGS

ANALYTICAL RESULTS SE253833 R0

Mercury in Soil [AN312] Tested: 20/9/2023

PARAMETER	UOM	LOR	J-230929 TP01 SOIL - 14/9/2023 SE253833.001	J-230929 TP02 SOIL - 14/9/2023 SE253833.002	J-230929 TP03 SOIL - 14/9/2023 SE253833.003	J-230929 TP04 SOIL - 14/9/2023 SE253833.004	J-230929 TP05 SOIL - 14/9/2023 SE253833.005
Mercury	mg/kg	0.05	**0.07**	**0.10**	**0.39**	**1.2**	**0.42**

SGS

ANALYTICAL RESULTS SE253833 R0

Moisture Content [AN002] Tested: 20/9/2023

PARAMETER	UOM	LOR	J-230929 TP01 SOIL - 14/9/2023 SE253833.001	J-230929 TP02 SOIL - 14/9/2023 SE253833.002	J-230929 TP03 SOIL - 14/9/2023 SE253833.003	J-230929 TP04 SOIL - 14/9/2023 SE253833.004	J-230929 TP05 SOIL - 14/9/2023 SE253833.005
% Moisture	%w/w	1	**16.0**	**19.0**	**10.3**	**37.5**	**50.1**

SGS

METHOD SUMMARY

SE253833 R0

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN040/AN320	A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by AAS or ICP as per USEPA Method 200.8.
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid , mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser . Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
***	Indicates that both * and ** apply.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety .

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SGS

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	George Barlow
Client	JMB ENVIRONMENTAL CONSULTING PTY LTD
Address	UNIT 15 77-79 BOURKE ROAD ALEXANDRIA NSW 2015
Telephone	0477 009 396
Facsimile	(Not specified)
Email	george@jmbec.com.au
Project	**J-230929**
Order Number	**J-230929**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE253879 R0**
Date Received	15/9/2023
Date Reported	20/9/2023

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Dong LIANG
Metals/Inorganics Team Leader

SGS

ANALYTICAL RESULTS

SE253879 R0

Metals in Paint by ICPOES [AN065/AN320] **Tested: 19/9/2023**

PARAMETER	UOM	LOR	J-230929 LP1 PAINT - 14/9/2023 SE253879.001	J-230929 LP2 PAINT - 14/9/2023 SE253879.002
Lead, Pb	%w/w	0.001	**0.31**	**3.9**
Arsenic, As*	%w/w	0.0025	<0.0025	<0.0025
Chromium, Cr*	%w/w	0.001	**0.002**	**0.014**

SGS

METHOD SUMMARY

SE253879 R0

METHOD	METHODOLOGY SUMMARY
AN065/AN320	A portion of paint chips sample is digested with nitric acid to solubilise the metals into solution. Digest then analysed by ICP OES with result calculated back to the as received paint sample basis .

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
***	Indicates that both * and ** apply.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety .

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Certificate of analysis – asbestos identification : S231581_J23092915092023AID-1

Hazmat Labs
Sydney Site Number 22690
15/77-79 Bourke Road Alexandria NSW 2015
P 02 8339 0312 | E lab@hazmatlabs.com.au | W hazmatlabs.com.au
ABN 92 158 286 600

CLIENT	JMB Environmental - BMCC	**JOB NUMBER**	S231581_J230929
CLIENT CONTACT	George Barlow	**DATE RECIEVED**	14/09/2023
CLIENT REFERENCE	J230929	**DATE ANALYSED**	15/09/2023
CLIENT EMAIL	george@jmbec.com	**SAMPLE DATE**	14/09/2023
CLIENT TELEPHONE	0477 009 396	**REPORT DATE**	18/09/2023

TEST METHOD:

Asbestos fibre qualitative determination in bulk & soil samples at Hazmat Labs laboratory, is conducted by polarised light microscopy, in conjunction with the dispersion staining technique. The strategies and methods used are as per AS4964(2004) and in-house SOP JMBEC D123. NATA accreditation number 19564.Accredited for compliance with ISO/IEC 17025 - Testing

SAMPLE REFERENCE	LABORATORY REFERENCE	SAMPLE INFORMATION	SAMPLE DIMENSIONS (mm)/WEIGHT(g)	ANALYTICAL RESULT
J230929 A1	S231581_J230929-J230929 A1	Putty	11.60 g	NAD, ORG
J230929 A2	S231581_J230929-J230929 A2	Putty	2.30 g	NAD, ORG
J230929 A3	S231581_J230929-J230929 A3	Mortar	7.30 g	NAD, ORG
J230929 A4	S231581_J230929-J230929 A4	Putty	0.30 g	NAD, ORG
J230929 A5	S231581_J230929-J230929 A5	Putty	1.50 g	NAD, ORG
J230929 A6	S231581_J230929-J230929 A6	Soil	50.30 g	NADRL, ORG
J230929 A7	S231581_J230929-J230929 A7	Soil	31.10 g	NADRL, ORG
J230929 A8	S231581_J230929-J230929 A8	Soil	31.90 g	NADRL, ORG
J230929 A9	S231581_J230929-J230929 A9	Soil	33.60 g	NADRL, ORG
J230929 A10	S231581_J230929-J230929 A10	Soil	36.90 g	NADRL, ORG

V0 - Initial Report

V1 - Report amended due to updating A3 sample material | Camila Coelho | 18/09/2023

Glossary and notes:

- *AS4964 recommends minimum sample sizes for all materials. In particular; soil sample volume is 60-100ml (approximately 60 to 250g), floor tiles require a recommended minimum of approximately 100cm², general samples should include a full cross section or be thick enough to represent the larger sampled material. It is the sampling party's responsibility to meet these sampling recommendations and others listed in AS4964, as such sample results apply only to the samples as received.*
- *Samples collected and analysed according to National Environment Protection (Assessment of Site Contamination) Measure (NEPM) or WA Department of health (DoH) are not cover by NATA accreditation.*
- *Hazmat Labs require receipt of all samples under a chain of custody, however Hazmat Labs accept no responsibility for the sampling method/location/transportation or packaging of samples from external sources. Please note these results apply only to the samples as received.*
- *"No asbestos detected by Polarized Light Microscopy in conjunction with Dispersion staining techniques. The client is advised to obtain a further result from an independent confirmatory analytical technique due to the nature of sample matrix, e.g. scanning or transmission electron microscopy (SEM/TEM).*

JMBEC D129 / Revision 13 / June 2023

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Hazmat Labs

Certificate of analysis – asbestos identification : S231581_J23092915092023AID-1

Hazmat Labs
Sydney Site Number 22690
15/77-79 Bourke Road Alexandria NSW 2015
P 02 8339 0312 | E lab@hazmatlabs.com.au | W hazmatlabs.com.au
ABN 92 158 286 600

NAD	No Asbestos Detected
NADRL	No asbestos found at the reporting limit (0.1g/kg / 0.01%w/w)
CHR	Chrysotile asbestos detected
AMO	Amosite asbestos detected
CRO	Crocidolite asbestos detected
ORG	Organic fibres detected
SMF	Synthetic Mineral Fibre detected
UMF	Unidentified Mineral Fibre detected

NATA
WORLD RECOGNISED ACCREDITATION

APPROVED ANALYST

Name: Camila Coelho **Signature:**

APPROVED SIGNATORY

Name: Lili Shi **Signature:**

Glossary and notes:

- *AS4964 recommends minimum sample sizes for all materials. In particular, soil sample volume is 60-100ml (approximately 80 to 260g), floor tiles require a recommended minimum of approximately 100cm², general samples should include a full cross section or be thick enough to represent the larger sampled material. It is the sampling party's responsibility to meet these sampling recommendations and others listed in AS4964, as such sample results apply only to the samples as received.*
- *Samples collected and analysed according to National Environment Protection (Assessment of Site Contamination) Measure (NEPM) or WA Department of health (DoH) are not cover by NATA accreditation.*
- *Hazmat Labs require receipt of all samples under a chain of custody, however Hazmat Labs accept no responsibility for the sampling method/location/transportation or packaging of samples from external sources. Please note these results apply only to the samples as received.*
- *"No asbestos detected by Polarized Light Microscopy in conjunction with Dispersion staining techniques. The client is advised to obtain a further result from an independent confirmatory analytical technique due to the nature of sample matrix, e.g. scanning or transmission electron microscopy (SEM/TEM).*

JMBEC D129 / Revision 13 / June 2023

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APPENDIX B

Lotsearch Report

LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Date: 09 Sep 2024 16:02:09

Reference: LS061287 EP

Address: Hornby Lighthouse, Watsons Bay, NSW 2192

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

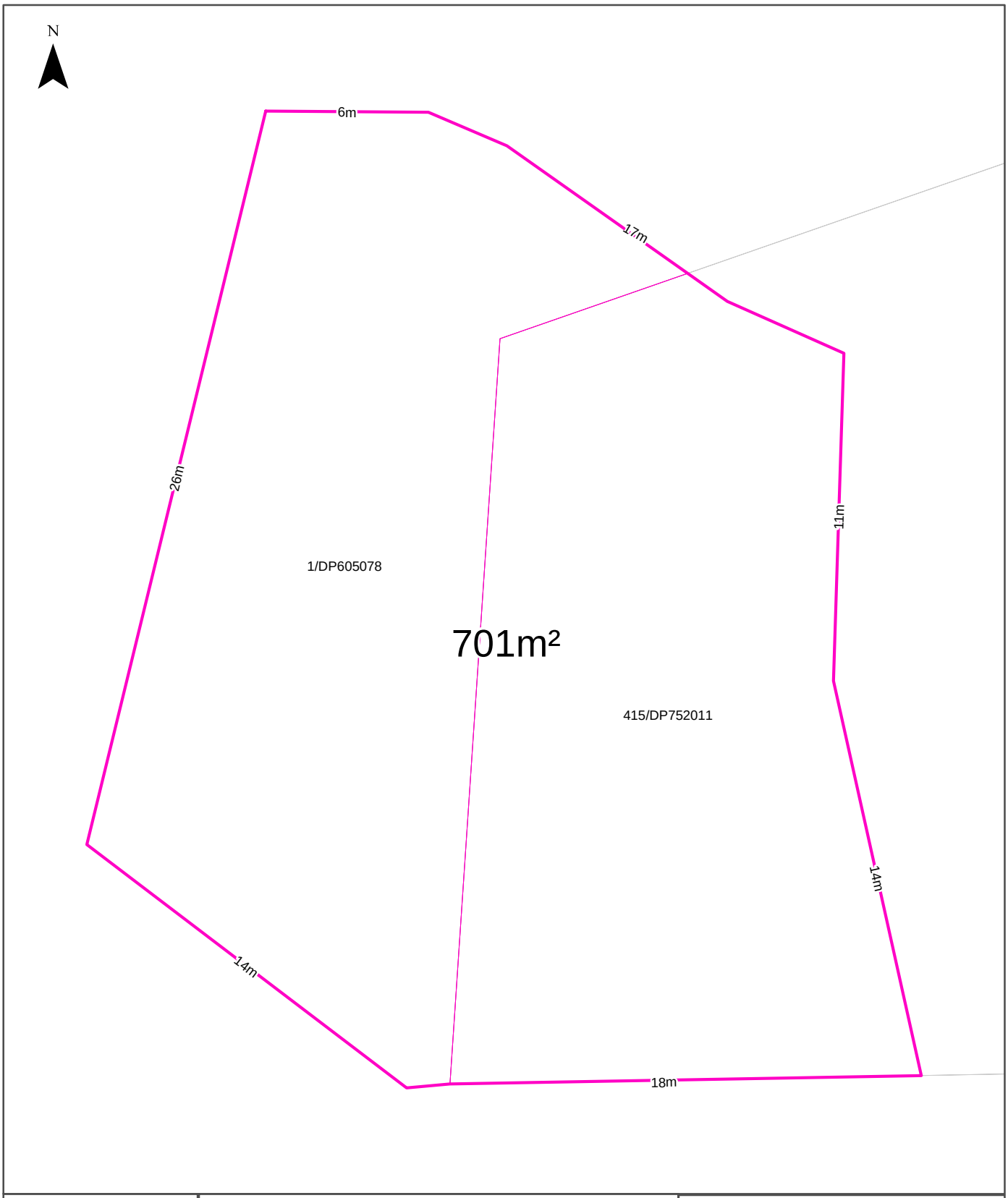
Datasets contained within this report, detailing their source and data currency:

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	24/07/2024	24/07/2024	Quarterly	-	-	-	-
Topographic Data	NSW Department of Customer Service - Spatial Services	21/05/2024	21/05/2024	Annually	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority NSW	02/09/2024	13/08/2024	Monthly	1000m	0	0	0
Contaminated Land Records of Notice	Environment Protection Authority NSW	02/09/2024	02/09/2024	Monthly	1000m	0	0	0
Former Gasworks	Environment Protection Authority NSW	06/08/2024	14/07/2021	Quarterly	1000m	0	0	0
Notices under the POEO Act 1997	Environment Protection Authority NSW	03/09/2024	03/09/2024	Monthly	1000m	0	0	0
National Waste Management Facilities Database	Geoscience Australia	29/04/2024	29/11/2022	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 NSW	19/08/2024	14/06/2024	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Investigation Sites	Australian Department of Defence	19/08/2024	19/08/2024	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Australian Department of Defence	19/08/2024	19/08/2024	Monthly	2000m	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	19/08/2024	19/08/2024	Monthly	2000m	0	0	0
Defence Controlled Areas	Australian Department of Defence	17/07/2024	17/07/2024	Quarterly	2000m	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Australian Department of Defence	05/08/2024	02/09/2022	Quarterly	2000m	0	0	2
National Unexploded Ordnance (UXO)	Australian Department of Defence	17/07/2024	17/07/2024	Quarterly	2000m	0	0	4
EPA Other Sites with Contamination Issues	Environment Protection Authority NSW	13/11/2023	15/12/2022	Annually	1000m	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority NSW	26/08/2024	26/08/2024	Monthly	1000m	0	0	0
Delicensed POEO Activities still regulated by the EPA	Environment Protection Authority NSW	26/08/2024	26/08/2024	Monthly	1000m	0	0	0
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority NSW	26/08/2024	26/08/2024	Monthly	1000m	0	3	3
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	100m	0	0	0
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	100m	-	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	250m	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	250m	-	0	0
Points of Interest	NSW Department of Customer Service - Spatial Services	18/07/2024	18/07/2024	Quarterly	1000m	1	3	23
Tanks (Areas)	NSW Department of Customer Service - Spatial Services	18/07/2024	18/07/2024	Quarterly	1000m	0	0	0
Tanks (Points)	NSW Department of Customer Service - Spatial Services	18/07/2024	18/07/2024	Quarterly	1000m	0	0	0
Major Easements	NSW Department of Customer Service - Spatial Services	09/08/2024	09/08/2024	Quarterly	1000m	0	0	1
State Forest	Forestry Corporation of NSW	12/12/2023	11/12/2023	Annually	1000m	0	0	0
Hydrogeology Map of Australia	Geoscience Australia	17/04/2024	19/08/2019	Annually	1000m	0	0	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 Climate Change, Energy, the Environment and Water	28/05/2024	23/02/2018	Quarterly	1000m	0	0	0
National Groundwater Information System (NGIS) Boreholes	Bureau of Meteorology; Water NSW	28/05/2024	20/06/2023	Annually	2000m	0	0	4
NSW Seamless Geology Single Layer: Rock Units	NSW Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	1	2	6
NSW Seamless Geology Single Layer: Trendlines	NSW Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	0	0	1
NSW Seamless Geology Single Layer: Geological Boundaries and Faults	NSW Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	0	0	0
Naturally Occurring Asbestos Potential	NSW Department of Regional NSW	26/04/2024	14/03/2024	Annually	1000m	0	0	0
Atlas of Australian Soils	Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES)	12/01/2024	17/02/2011	Annually	1000m	1	1	1
Soil Landscapes of Central and Eastern NSW	NSW Department of Climate Change, Energy, the Environment and Water	12/12/2023	27/07/2020	Annually	1000m	1	1	3
Environmental Planning Instrument Acid Sulfate Soils	NSW Department of Planning, Housing and Infrastructure	12/08/2024	12/07/2024	Monthly	500m	1	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	12/01/2024	21/02/2013	Annually	1000m	1	2	3
Dryland Salinity - National Assessment	Australian Bureau of Agricultural and Resource Economics and Sciences	03/06/2024	24/05/2024	Annually	1000m	0	0	0
Mining Subsidence Districts	NSW Department of Customer Service	06/08/2024	06/08/2024	Quarterly	1000m	0	0	0
Current Mining Titles	NSW Department of Regional NSW	26/08/2024	26/08/2024	Monthly	1000m	0	0	0
Mining Title Applications	NSW Department of Regional NSW	26/08/2024	26/08/2024	Monthly	1000m	0	0	0
Historic Mining Titles	NSW Department of Regional NSW	26/08/2024	26/08/2024	Monthly	1000m	12	12	13
Environmental Planning Instrument SEPP State Significant Precincts	NSW Department of Planning, Housing and Infrastructure	12/08/2024	08/09/2023	Monthly	1000m	0	0	0
Environmental Planning Instrument Land Zoning	NSW Department of Planning, Housing and Infrastructure	12/08/2024	26/07/2024	Monthly	1000m	2	3	13
Commonwealth Heritage List	Australian Department of Climate Change, Energy, the Environment and Water	20/10/2023	13/04/2022	Annually	1000m	0	0	3
National Heritage List	Australian Department of Climate Change, Energy, the Environment and Water	20/10/2023	13/04/2022	Annually	1000m	0	0	0
State Heritage Register - Curtilages	NSW Department of Planning, Industry and Environment	29/07/2024	05/07/2024	Quarterly	1000m	1	1	1
Environmental Planning Instrument Local Heritage	NSW Department of Planning, Housing and Infrastructure	12/08/2024	26/07/2024	Monthly	1000m	2	2	30
Bush Fire Prone Land	NSW Rural Fire Service	26/08/2024	19/07/2024	Monthly	1000m	0	0	0
NSW Native Vegetation Type Map	NSW Department of Climate Change, Energy, the Environment and Water	02/09/2024	30/11/2023	Quarterly	1000m	1	7	47
Ramsar Wetlands of Australia	Australian Department of Climate Change, Energy, the Environment and Water	16/05/2024	11/04/2024	Annually	1000m	0	0	0
Collaborative Australian Protected Areas Database (CAPAD) 2022 - Terrestrial	Australian Department of Climate Change, Energy, The Environment and Water	04/03/2024	30/06/2022	Annually	1000m	1	1	1
Collaborative Australian Protected Areas Database (CAPAD) 2022 - Marine	Australian Department of Climate Change, Energy, The Environment and Water	04/03/2024	30/06/2022	Annually	1000m	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	28/05/2024	28/05/2024	Annually	1000m	0	0	0
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	28/05/2024	28/05/2024	Annually	1000m	0	0	0
NSW BioNet Species Sightings	NSW Department of Climate Change, Energy, the Environment and Water	16/08/2024	16/08/2024	Monthly	10000m	-	-	-

Site Diagram

Hornby Lighthouse, Watsons Bay, NSW 2192



Legend

- Site Boundary
- Internal Parcel Boundaries

Total Area: 701m²

Total Perimeter: 105m

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.

Scale: 0 5 10 Meters

Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2024

Coordinate System: GDA 1994 MGA Zone 56

Date: 09 September 2024

Contaminated Land

Hornby Lighthouse, Watsons Bay, NSW 2192

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

Hornby Lighthouse, Watsons Bay, NSW 2192

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

Hornby Lighthouse, Watsons Bay, NSW 2192

EPA Notices

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

Map ID	Number	Type	Name	Address	Status	Issued Date	Act	Offence	Offence Date	Loc Conf	Dist	Dir
N/A												

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

Waste Management & Liquid Fuel Facilities

Hornby Lighthouse, Watsons Bay, NSW 2192

National Waste Management Facilities Database

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

Map ID	Owner	Name	Address	Management Type	Facility Type	Status	Loc Conf	Dist	Dir
N/A	No records in buffer								

Source: Waste Management Facilities Database
Creative Commons 4.0 © Commonwealth of Australia (Geoscience Australia) 2022

National Liquid Fuel Facilities

National Liquid Fuel Facilties 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
Creative Commons 4.0 © Commonwealth of Australia

PFAS Investigation & Management Programs

Hornby Lighthouse, Watsons Bay, NSW 2192

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

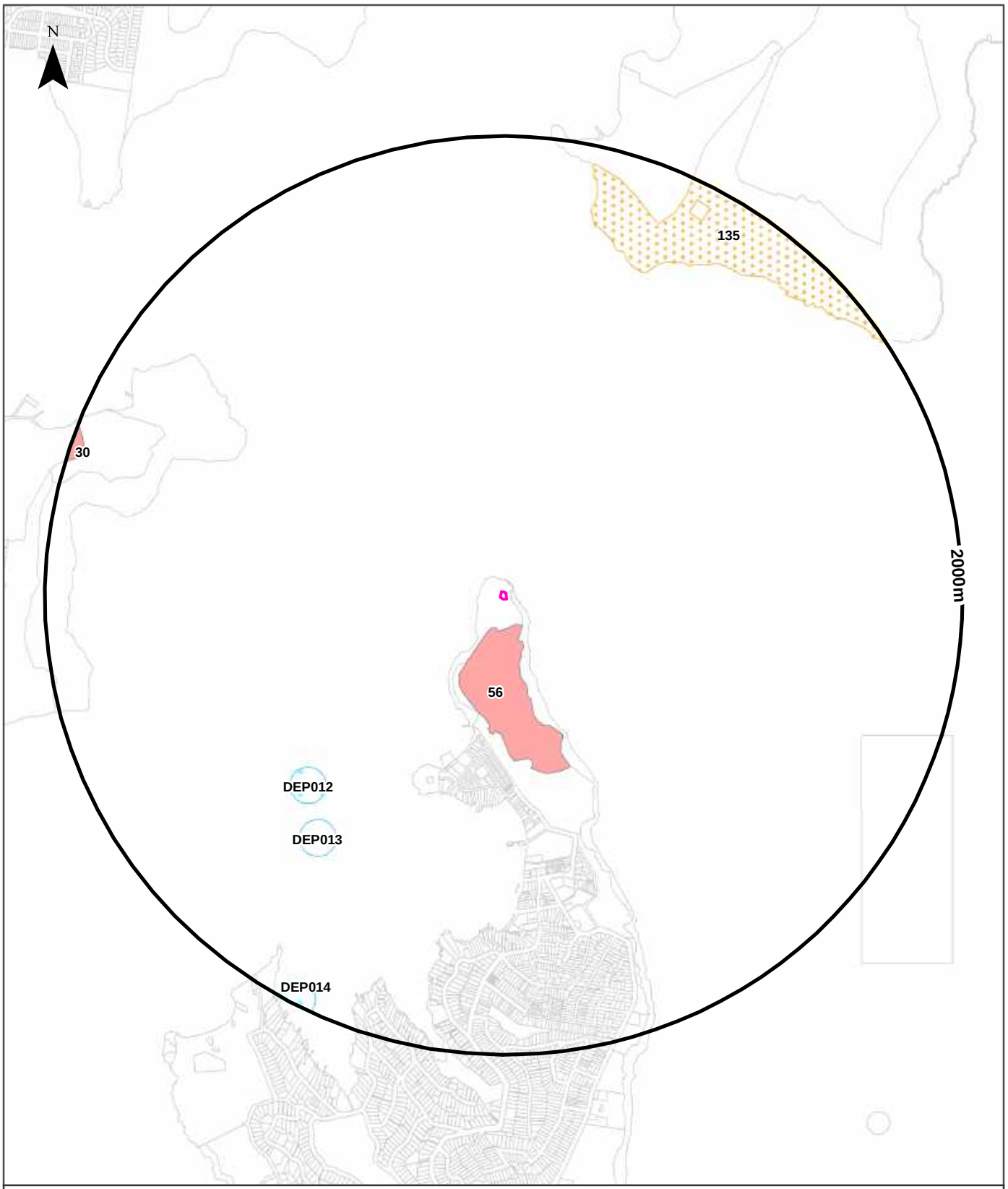
Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

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

Hornby Lighthouse, Watsons Bay, NSW 2192



Defence Sites and Unexploded Ordnance

Hornby Lighthouse, Watsons Bay, NSW 2192

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
56	HMAS Watson	Watsons Bay, New South Wales	YES	Premise Match	116m	South
30	HMAS Penguin	Balmoral, New South Wales	YES	Premise Match	1922m	West

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
DEP012	Potential Depth Charge UXO - Port Jackson	Sea Dumping of Depth Charges	This site was an area where Depth Charges were used in WW2.		Not Commonwealth Land	As Supplied	1103m	South West
DEP013	Potential Depth Charge UXO - Port Jackson	Sea Dumping of Depth Charges	This site was an area where Depth Charges were used in WW2.		Not Commonwealth Land	As Supplied	1247m	South West
135	North Head	Slight Potential	This site was used for Defence purposes since the 1920's including a Coastal Artillery Emplacement.		Not Commonwealth Land	As Supplied	1527m	North East
DEP014	Potential Depth Charge UXO - Port Jackson	Sea Dumping of Depth Charges	This site was an area where Depth Charges were used in WW2.		Not Commonwealth Land	As Supplied	1898m	South West

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

EPA Other Sites with Contamination Issues

Hornby Lighthouse, Watsons Bay, NSW 2192

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

Hornby Lighthouse, Watsons Bay, NSW 2192

Licensed Activities under the POEO Act 1997

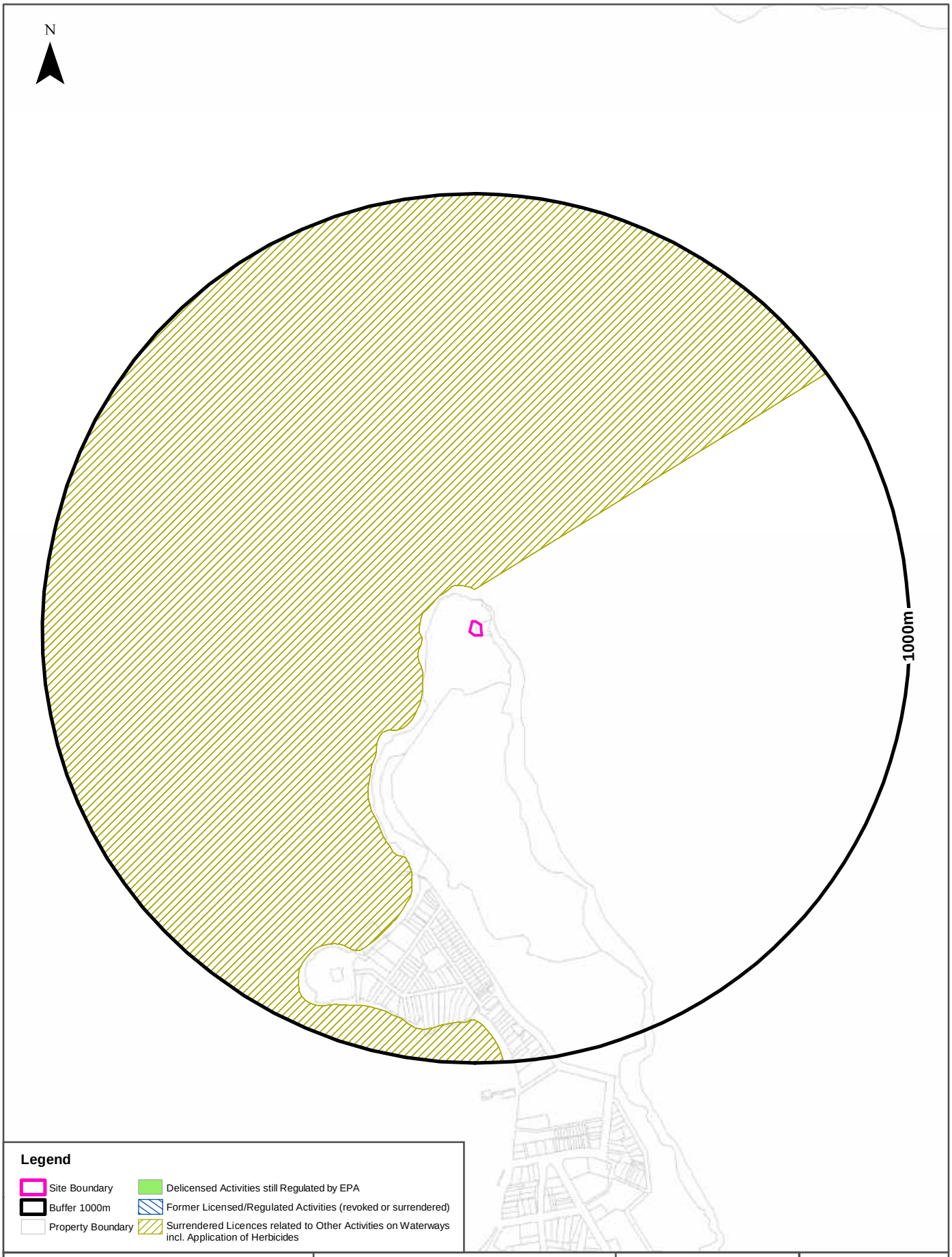
Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

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

Delicensed & Former Licensed EPA Activities

Hornby Lighthouse, Watsons Bay, NSW 2192



EPA Activities

Hornby Lighthouse, Watsons Bay, NSW 2192

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	74m	North West
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	74m	North West
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	74m	North West

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

Historical Business Directories

Hornby Lighthouse, Watsons Bay, NSW 2192

Business Directory Records 1950-1991
Premise or Road Intersection Matches

Potentially contaminative business activities extracted from Universal Business Directories from years 1991, 1986, 1982, 1978, 1975, 1970, 1965, 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						

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Business Directory Records 1950-1991
Road or Area Matches

Potentially contaminative business activities extracted from Universal Business Directories from years 1991, 1986, 1982, 1978, 1975, 1970, 1965, 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					

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Historical Business Directories

Hornby Lighthouse, Watsons Bay, NSW 2192

Dry Cleaners, Motor Garages & Service Stations 1948-1993 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.

Note: The Universal Business Directories were published between 1948 and 1993. Dry Cleaners, Motor Garages & Service Stations have been extracted from all of these directories except the following years 1951, 1955, 1957, 1960, 1963, 1973, 1974, 1977, 1987.

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

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Dry Cleaners, Motor Garages & Service Stations 1948-1993 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.

Note: The Universal Business Directories were published between 1948 and 1993. Dry Cleaners, Motor Garages & Service Stations have been extracted from all of these directories except the following years 1951, 1955, 1957, 1960, 1963, 1973, 1974, 1977, 1987.

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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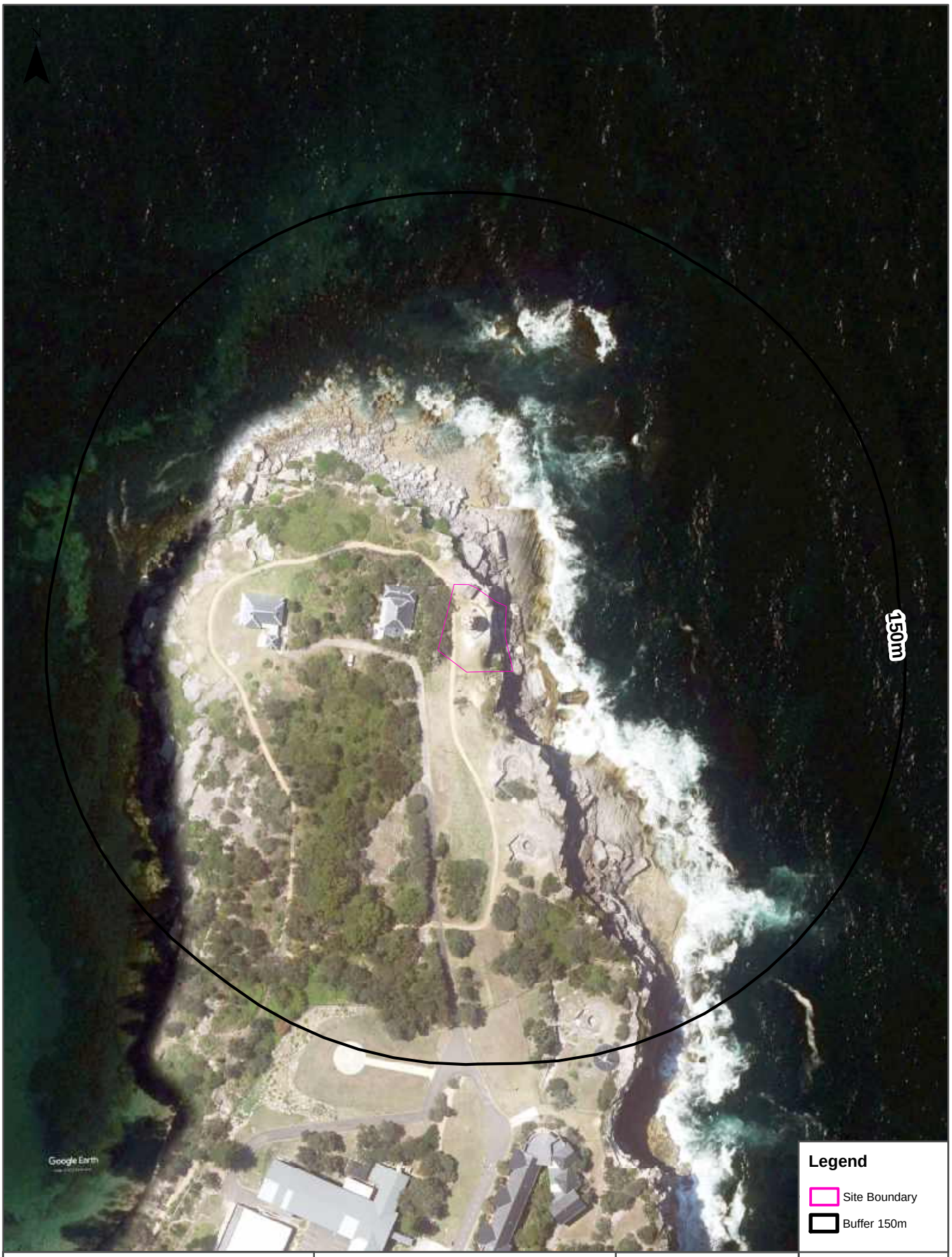
Aerial Imagery 2024

Hornby Lighthouse, Watsons Bay, NSW 2192

Aerial Imagery 2014

Hornby Lighthouse, Watsons Bay, NSW 2192

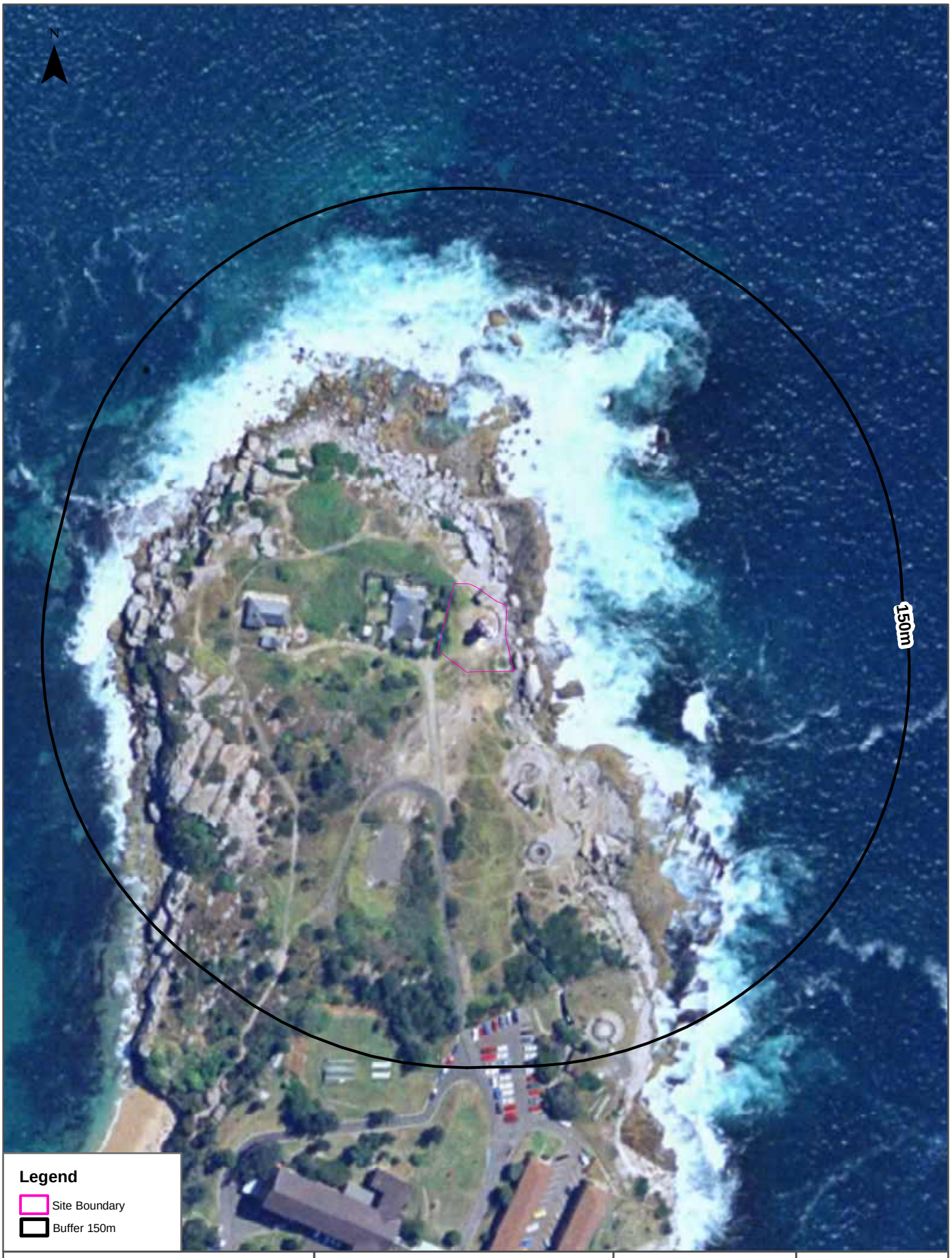


Aerial Imagery 2006

Hornby Lighthouse, Watsons Bay, NSW 2192

Aerial Imagery 1994

Hornby Lighthouse, Watsons Bay, NSW 2192



Scale: 0 20 40 60 80 Meters	Data Sources: Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 09 September 2024

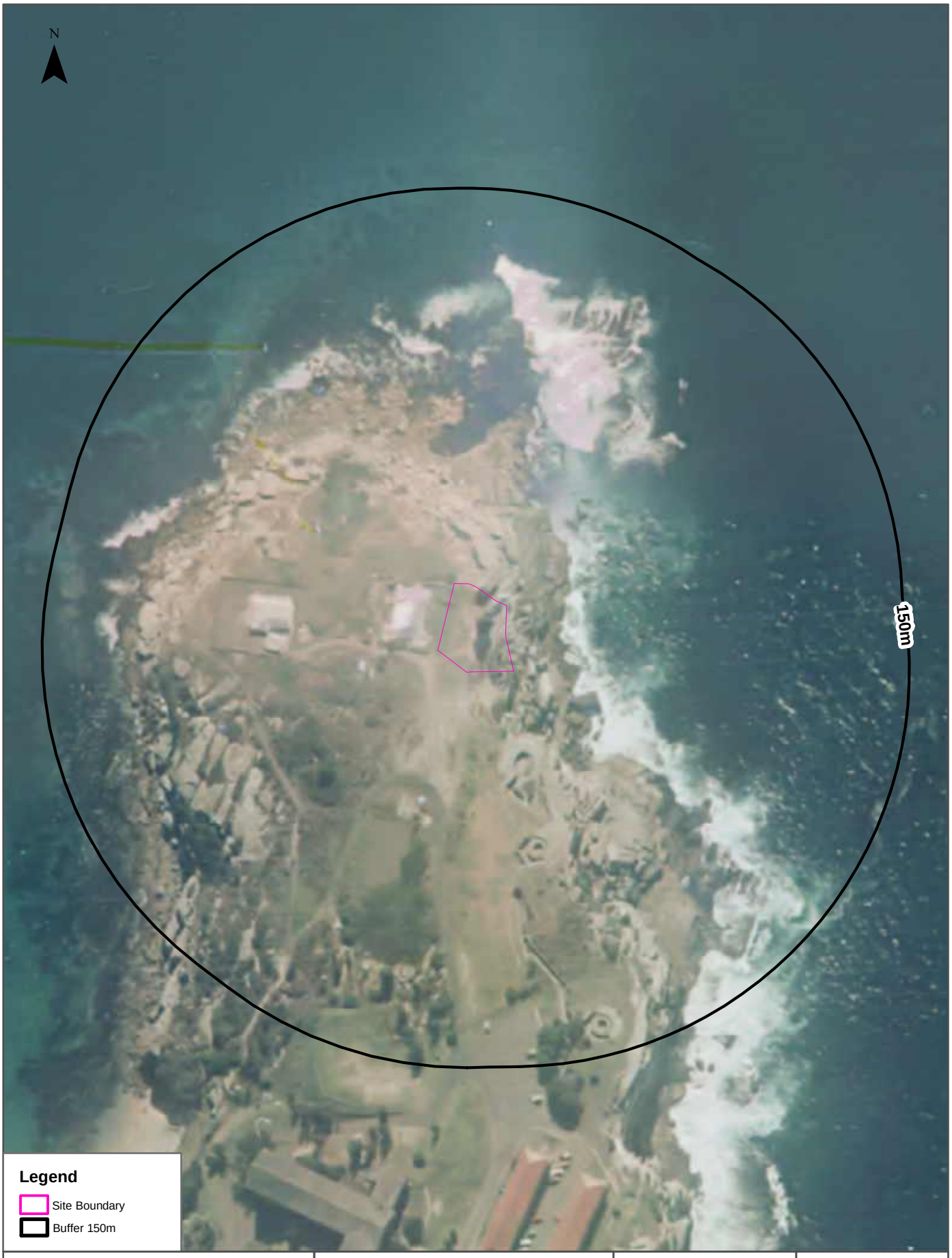
Aerial Imagery 1991

Hornby Lighthouse, Watsons Bay, NSW 2192

Scale:	Data Sources: Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 09 September 2024

Aerial Imagery 1986

Hornby Lighthouse, Watsons Bay, NSW 2192



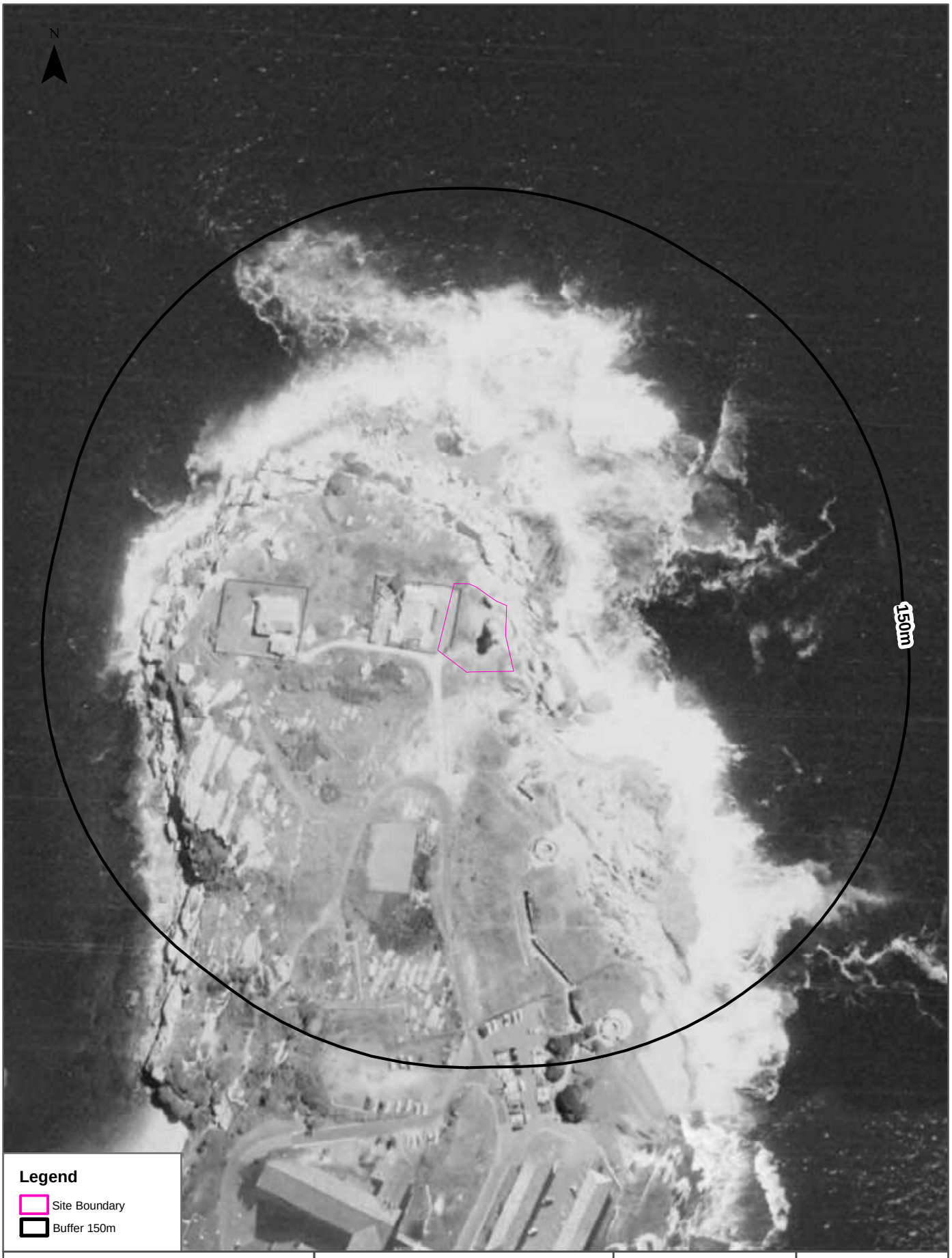
Aerial Imagery 1982

Hornby Lighthouse, Watsons Bay, NSW 2192

Scale: 0 20 40 60 80 Meters	Data Sources: Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 09 September 2024

Aerial Imagery 1978

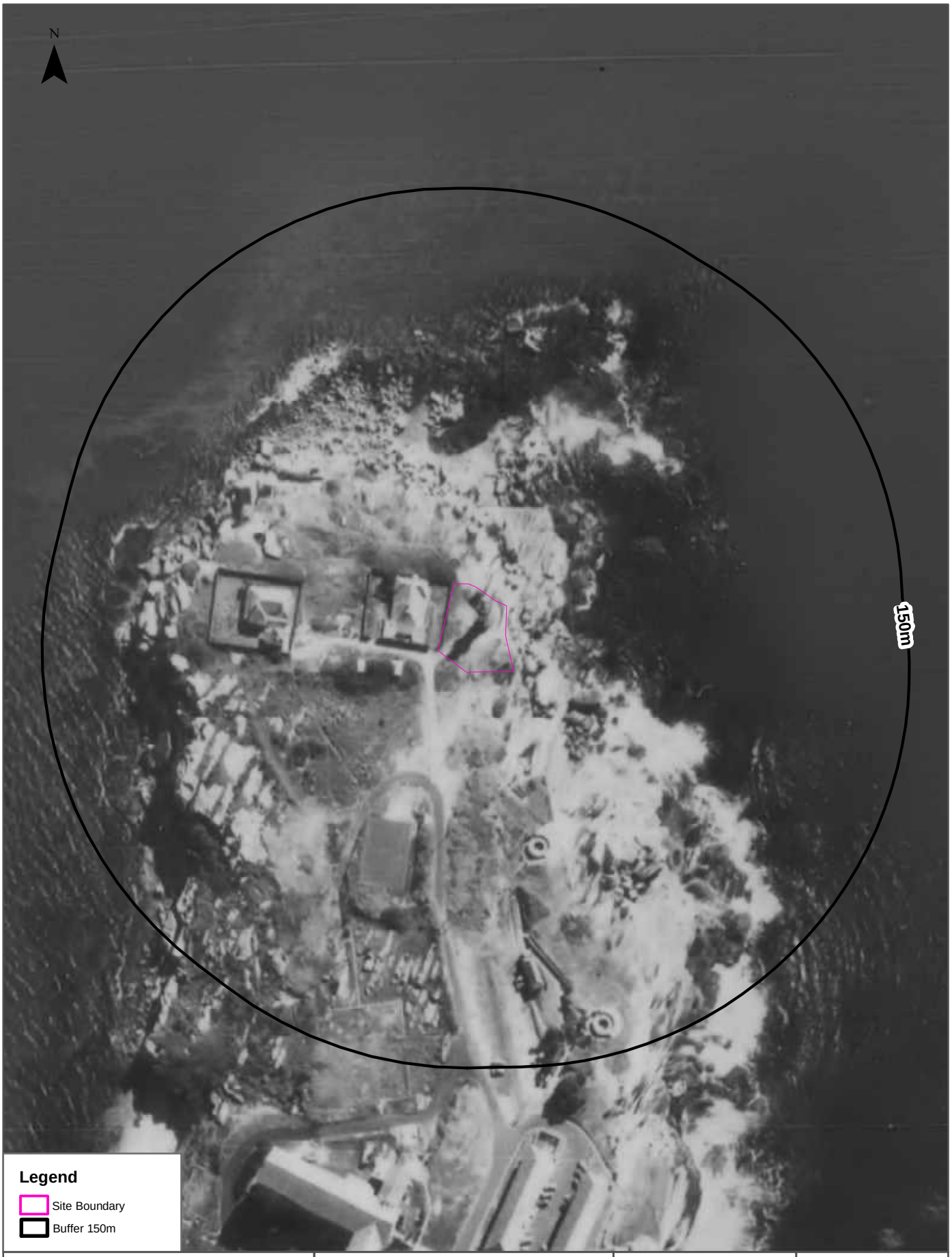
Hornby Lighthouse, Watsons Bay, NSW 2192



Scale: 0 20 40 60 80 Meters	Data Sources: Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 09 September 2024

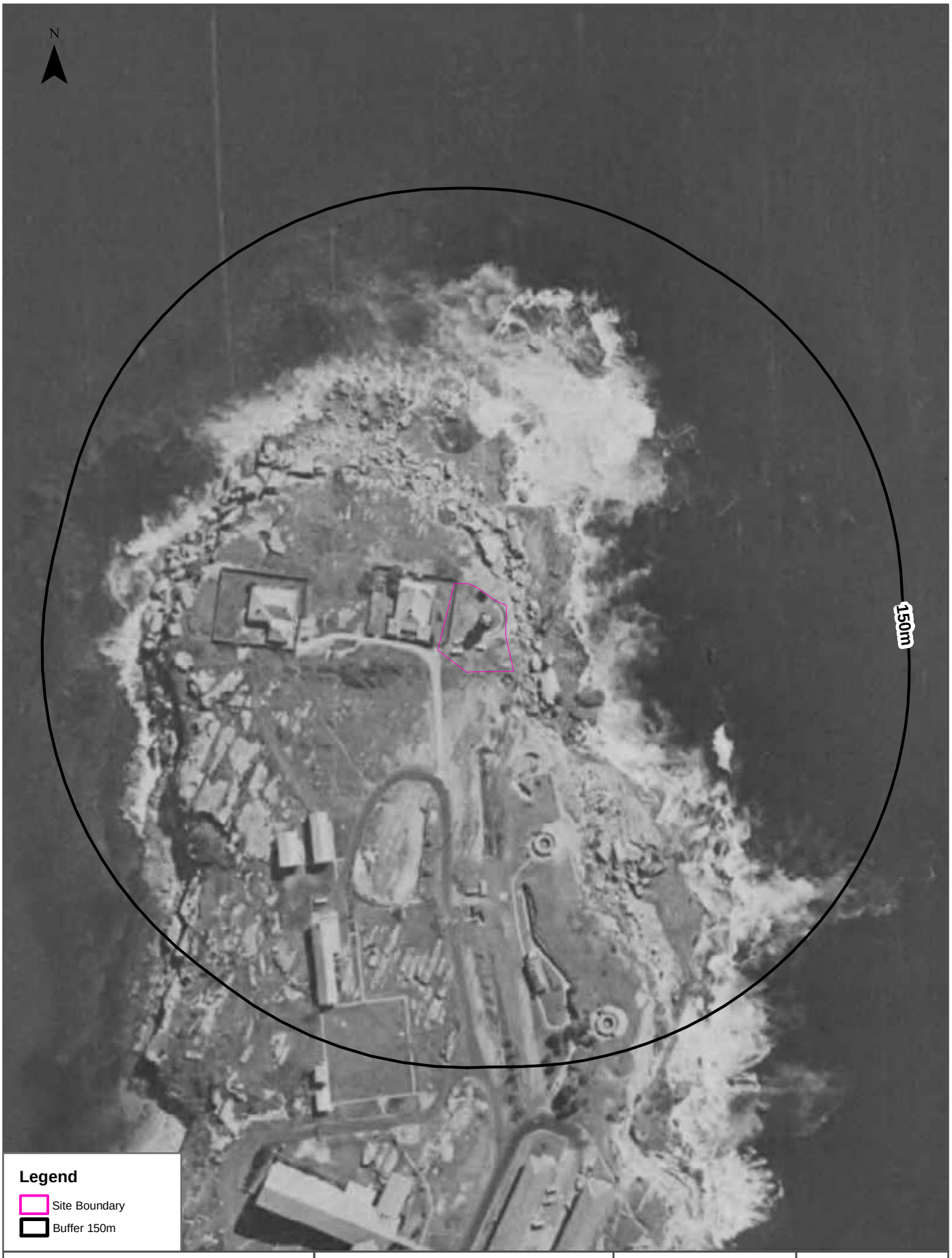
Aerial Imagery 1970

Hornby Lighthouse, Watsons Bay, NSW 2192



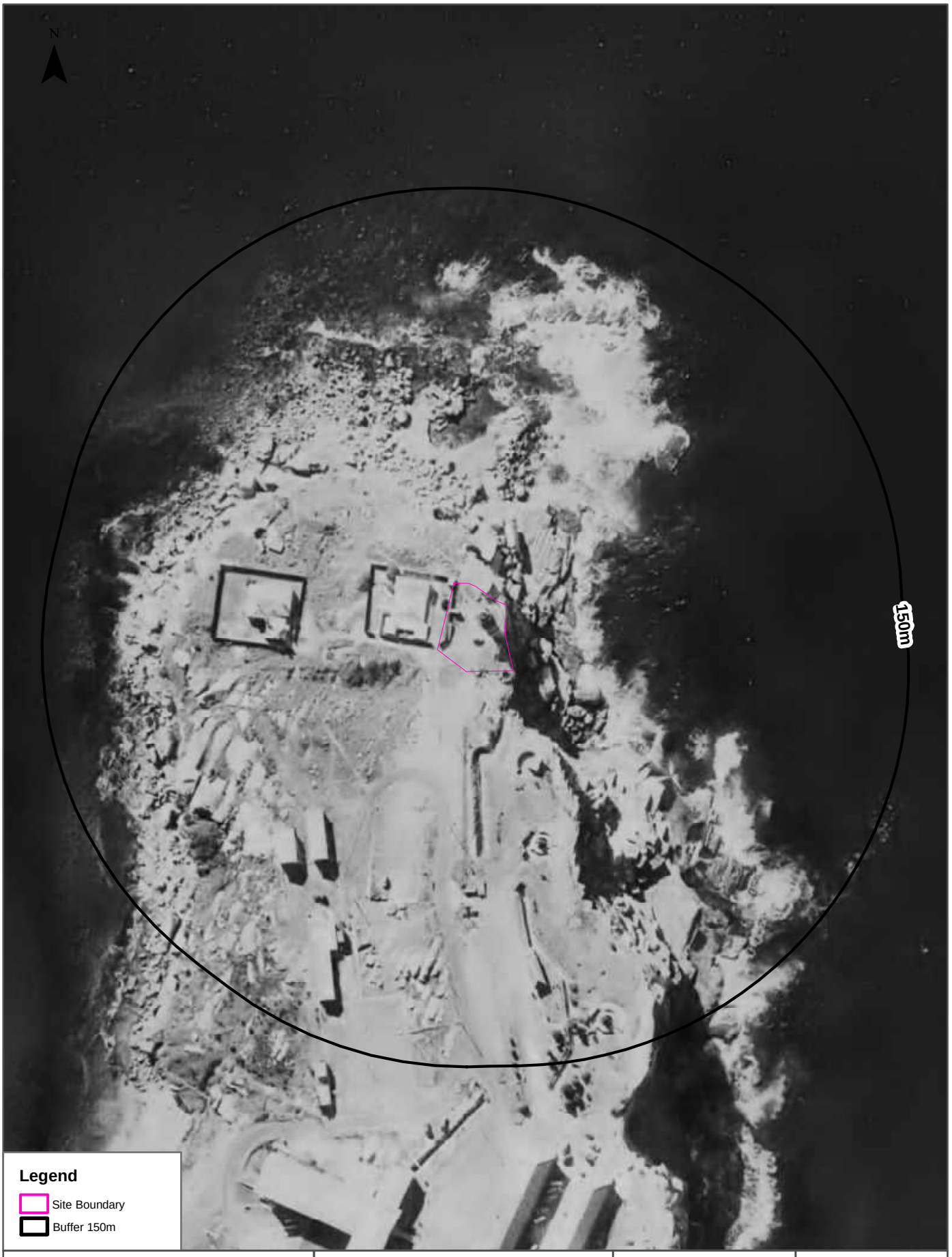
Aerial Imagery 1965

Hornby Lighthouse, Watsons Bay, NSW 2192



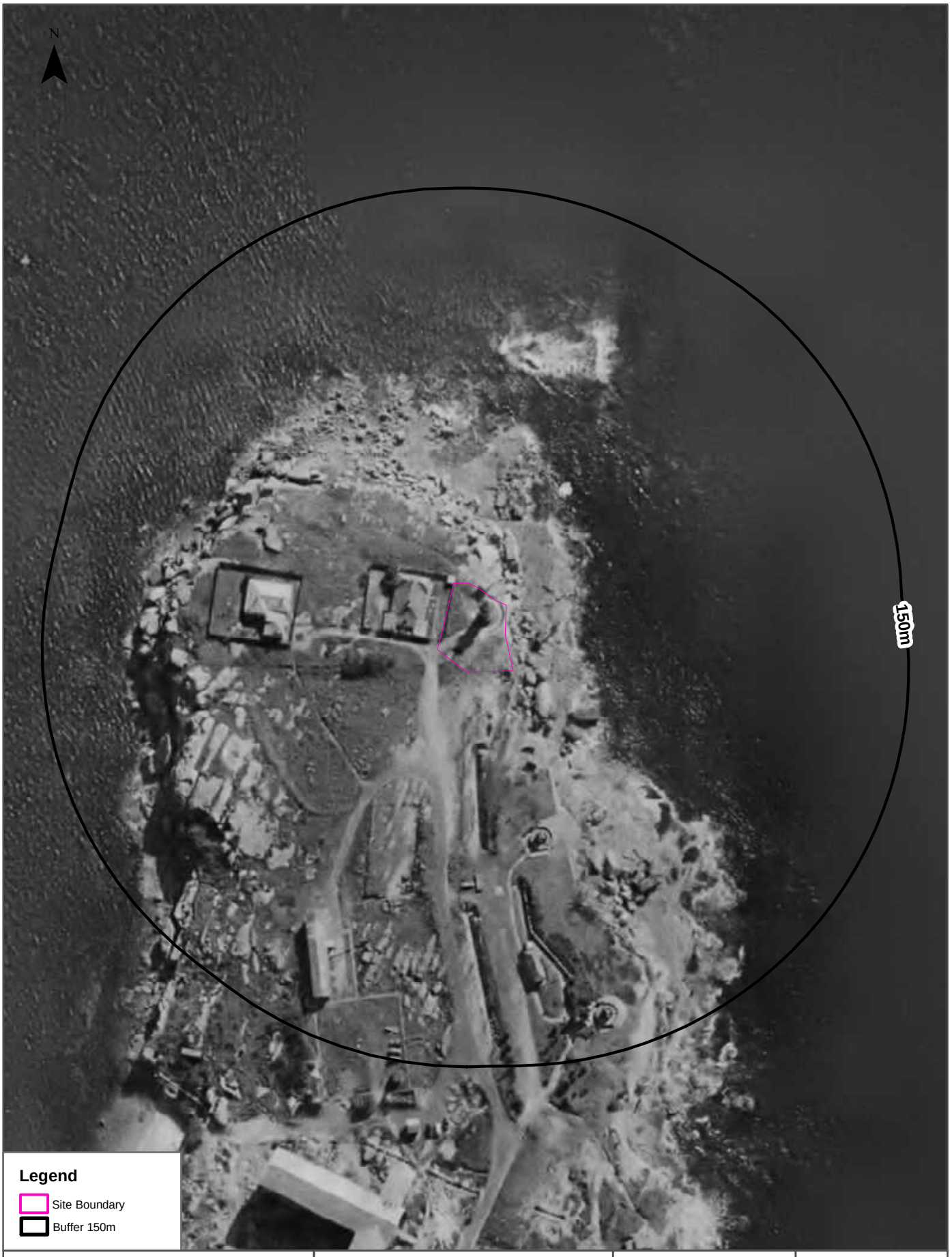
Aerial Imagery 1961

Hornby Lighthouse, Watsons Bay, NSW 2192



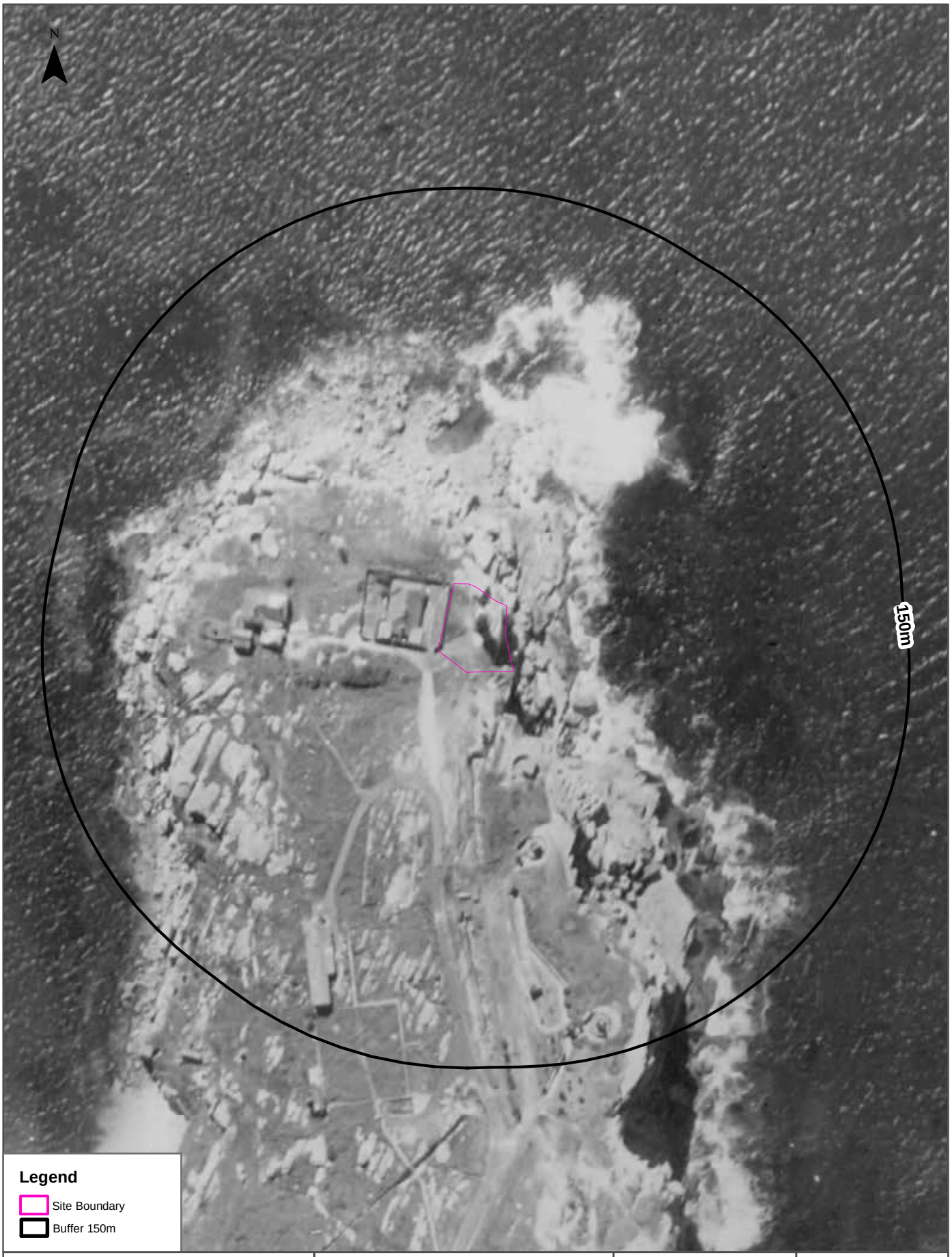
Aerial Imagery 1955, 1956

Hornby Lighthouse, Watsons Bay, NSW 2192



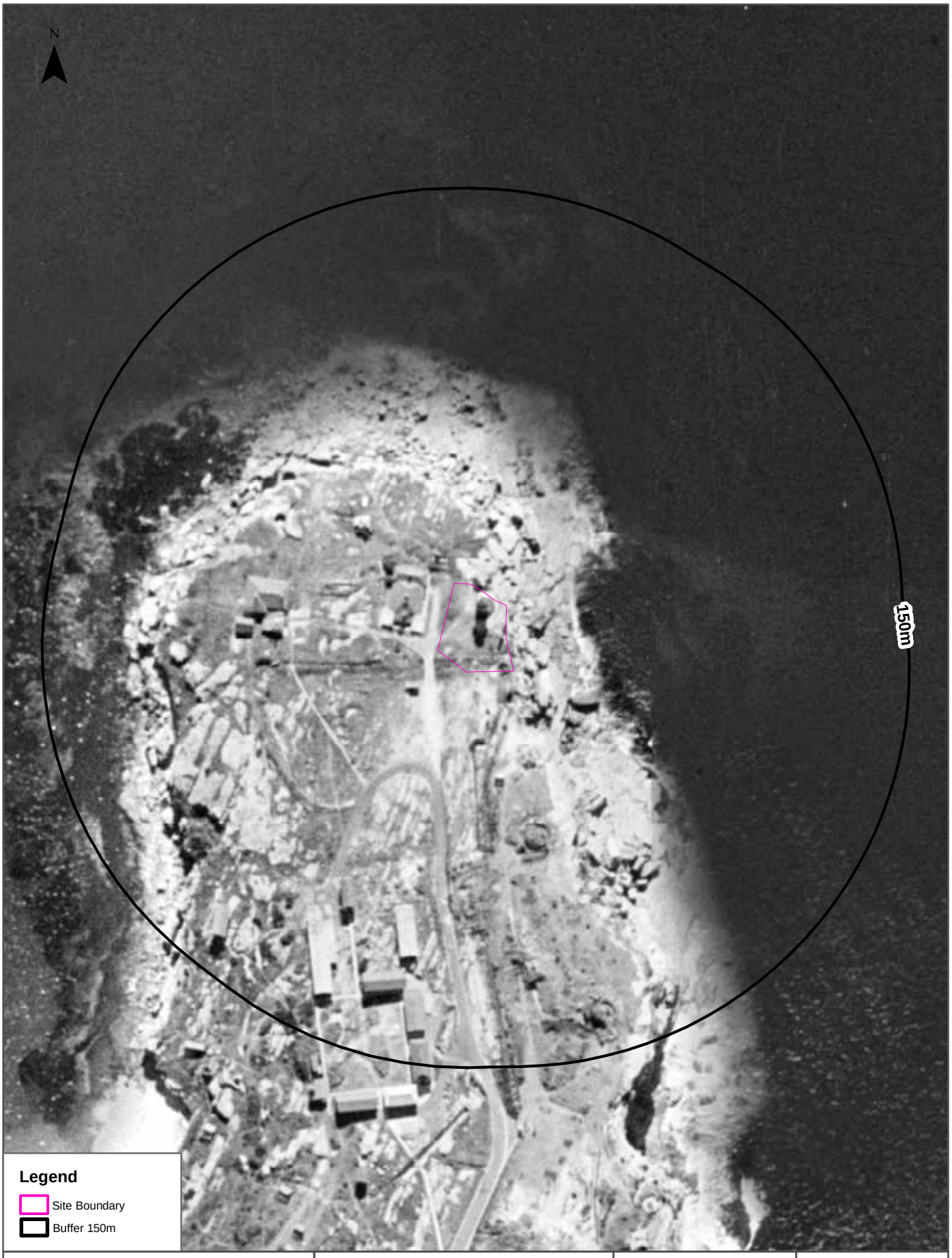
Aerial Imagery 1951

Hornby Lighthouse, Watsons Bay, NSW 2192



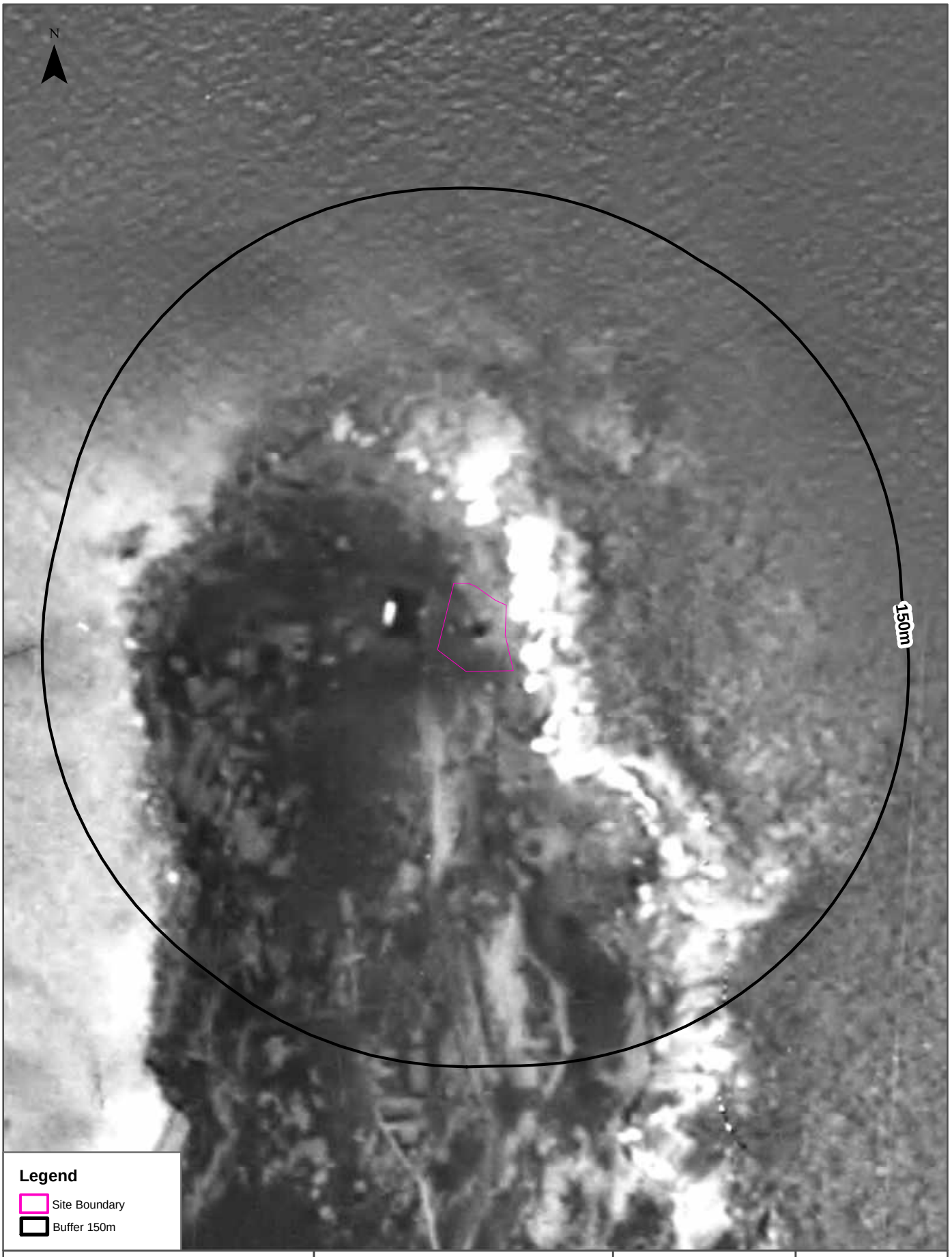
Aerial Imagery 1943

Hornby Lighthouse, Watsons Bay, NSW 2192



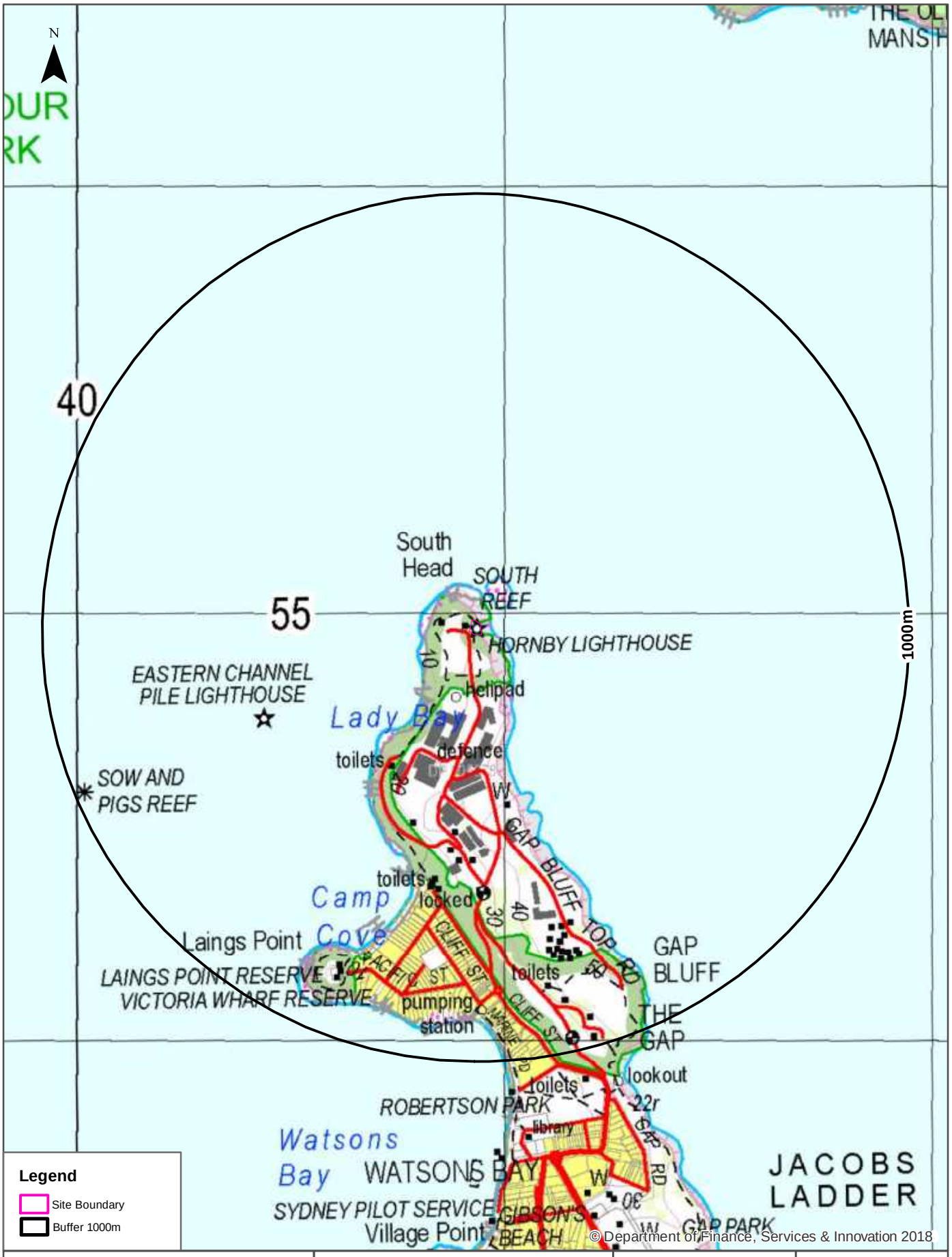
Aerial Imagery 1930

Hornby Lighthouse, Watsons Bay, NSW 2192



Topographic Map 2015

Hornby Lighthouse, Watsons Bay, NSW 2192



Scale: 0 140 280 420 560 Meters

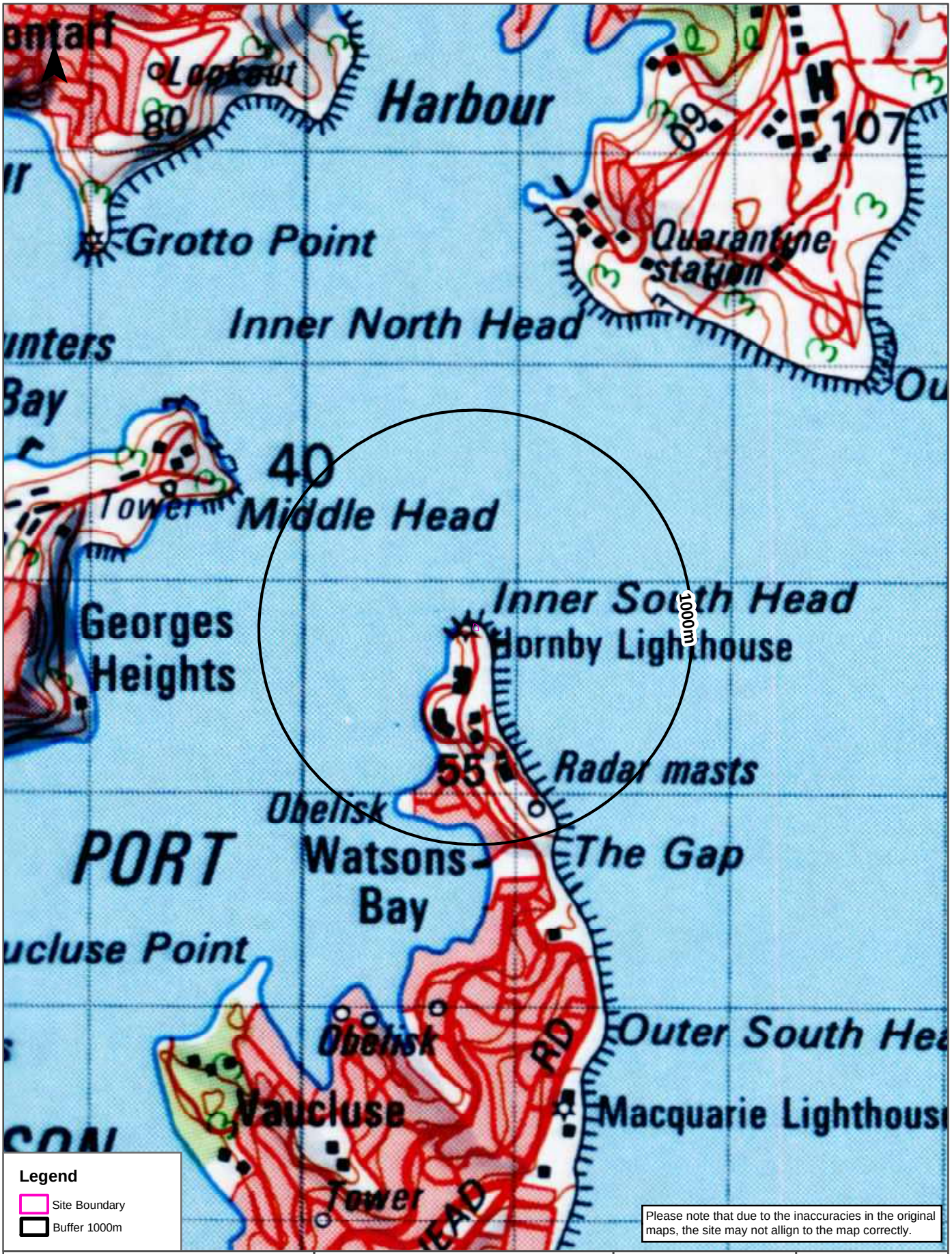
Data Sources: Topographic Map Data
© NSW Land and Property Information

Coordinate System:
GDA 1994 MGA Zone 56

Date: 09 September 2024

Historical Map 1975

Hornby Lighthouse, Watsons Bay, NSW 2192



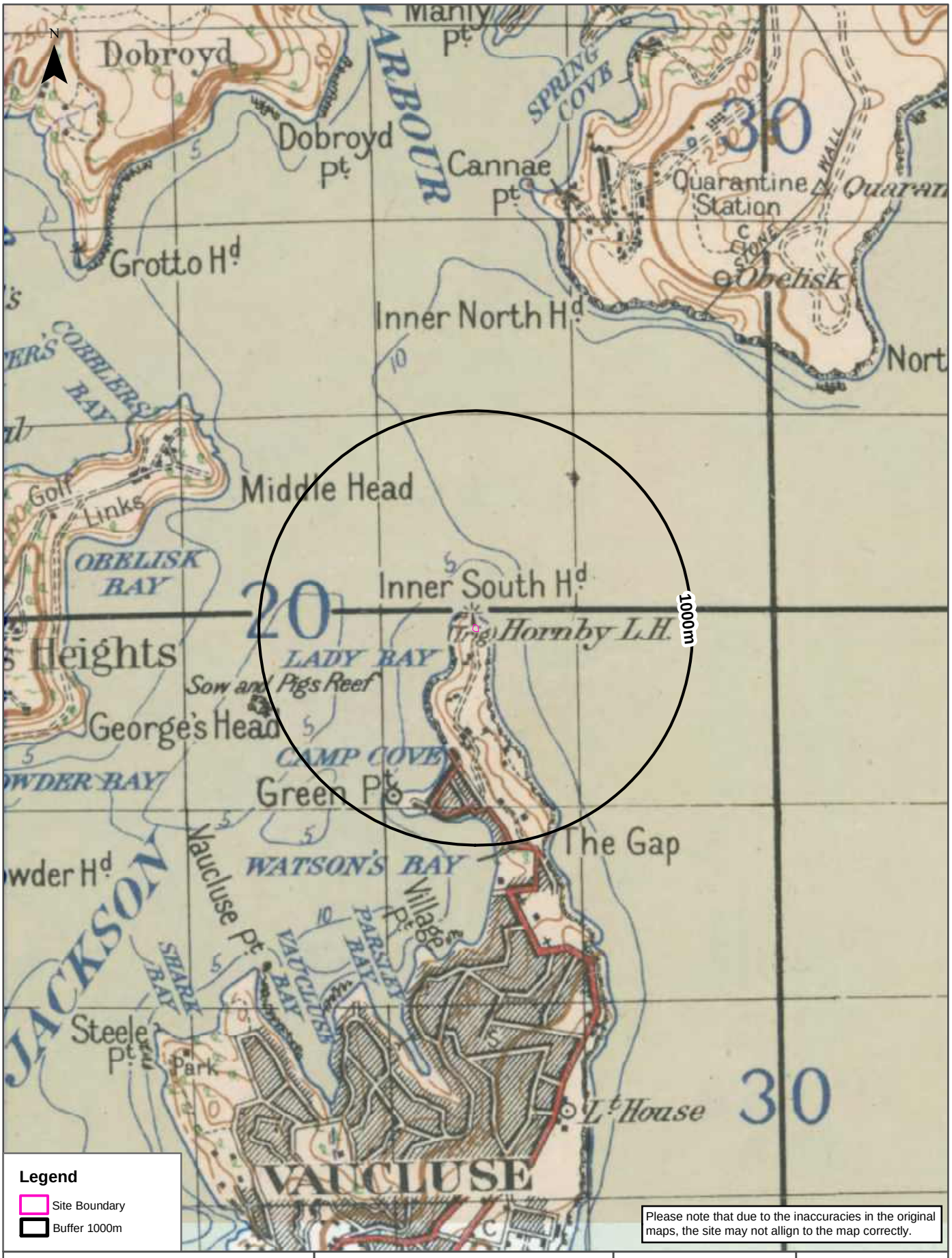
Please note that due to the inaccuracies in the original maps, the site may not allign to the map correctly.

Scale:	Data Sources: NATMAP 1:100,000 Topographic Maps Geoscience Australia	Coordinate System: GDA 1994 MGA Zone 56	Date: 09 September 2024

0 280 560 840 1,120 Meters

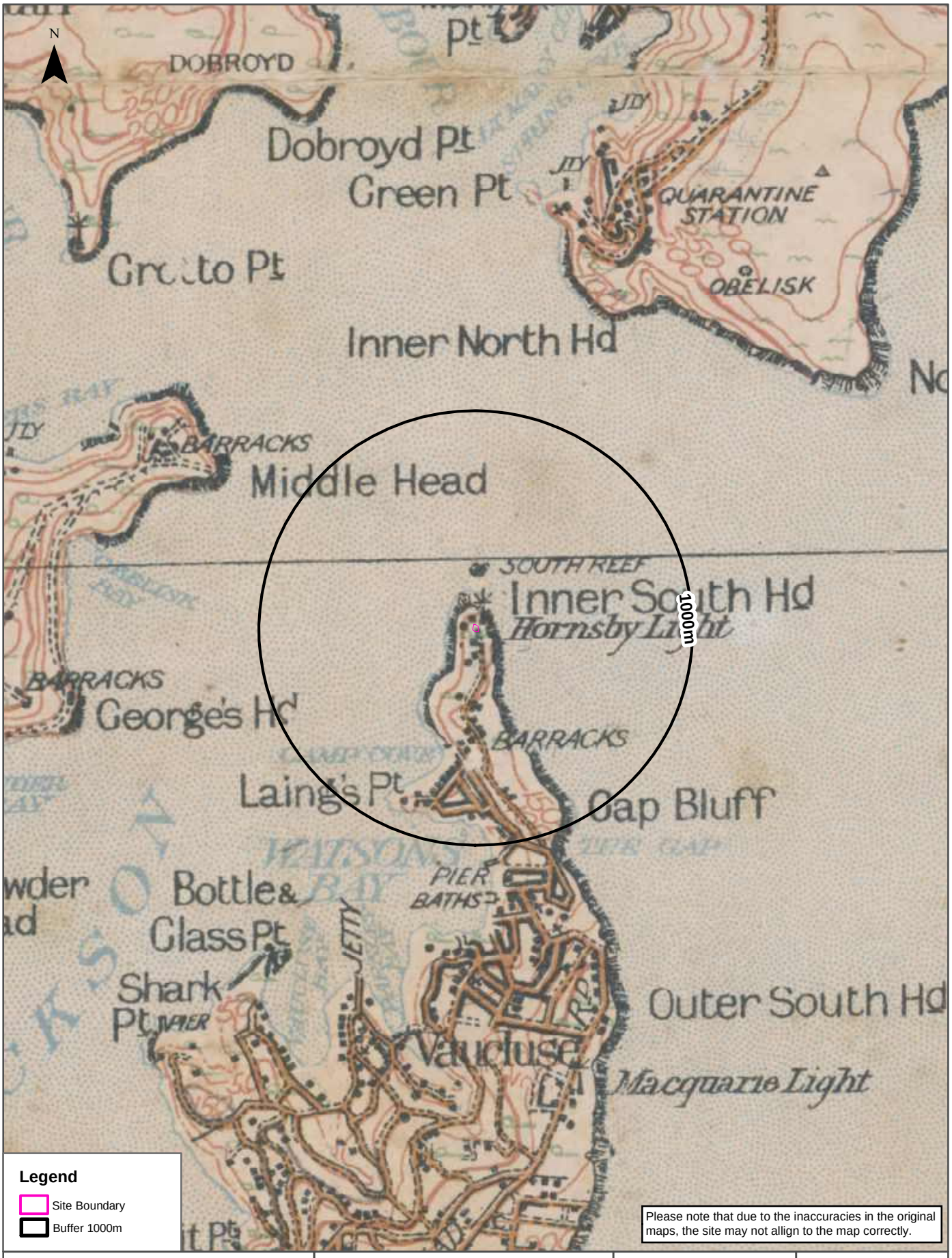
Historical Map c.1936

Hornby Lighthouse, Watsons Bay, NSW 2192



Historical Map c.1917

Hornby Lighthouse, Watsons Bay, NSW 2192



Legend

- Site Boundary
- Buffer 1000m

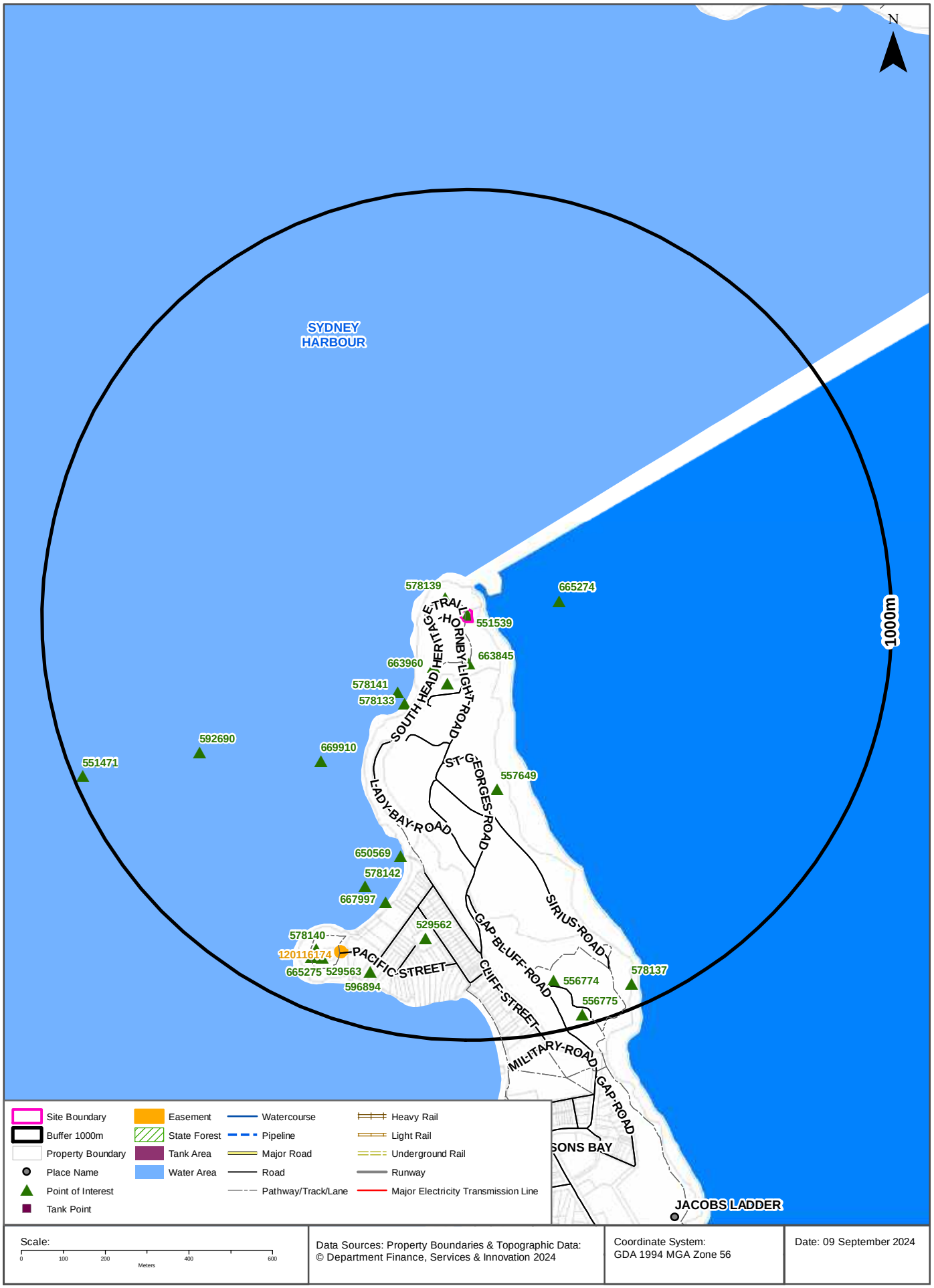
Please note that due to the inaccuracies in the original maps, the site may not allign to the map correctly.

Scale:	Data Sources: Australia 1:63360 Produced by Australian Section Imperial General Staff	Coordinate System: GDA 1994 MGA Zone 56	Date: 09 September 2024

0 280 560 840 1,120
Meters

Topographic Features

Hornby Lighthouse, Watsons Bay, NSW 2192



Topographic Features

Hornby Lighthouse, Watsons Bay, NSW 2192

Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
551539	Lighthouse	HORNBY LIGHTHOUSE	0m	On-site
578139	Headland	SOUTH HEAD	49m	North West
663845	Picnic Area	SOUTH HEAD PICNIC AREA	100m	South
663960	Lookout	HORNBY LIGHTHOUSE SOUTH HEAD	131m	South West
556766	Helipad	Helipad	153m	South
665274	Historic Site	CAMP COVE TIDE GAUGE	210m	East
578141	Bay / Inlet / Basin	LADY BAY	232m	South West
578133	Beach	LADY BAY BEACH	243m	South West
557649	Place Of Worship	INTER-DENOMINATIONAL CHURCH	404m	South
669910	Bay Like	EASTERN CHANNEL	477m	South West
650569	Wharf	Wharf	581m	South
578142	Bay / Inlet / Basin	CAMP COVE	676m	South
667997	Beach	CAMP COVE BEACH	696m	South
592690	Lighthouse	EASTERN CHANNEL PILE LIGHTHOUSE	701m	South West
529562	Park	CAMP COVE RESERVE	762m	South
578140	Headland	LAINGS POINT	859m	South West
596894	Park	VICTORIA WHARF RESERVE	868m	South
529563	Park	LAINGS POINT RESERVE	873m	South West
556774	Tourist Attraction	THE ARMOURY	878m	South
665275	Monument	GREEN POINT OBELISK	881m	South West
578137	Mountain Like	GAP BLUFF	945m	South East
556775	Tourist Attraction	THE OFFICERS MESS	975m	South
551471	Reef	SOW AND PIGS REEF	978m	South West

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

Hornby Lighthouse, Watsons Bay, NSW 2192

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
120116174	Primary	Undefined		829m	South

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

Hornby Lighthouse, Watsons Bay, NSW 2192

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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Elevation Contours (m AHD)

Hornby Lighthouse, Watsons Bay, NSW 2192

Accuracy & Currency: This contour data can be up to 0.4 of the contour interval out in height and must therefore not be used for any design or engineering works, but only as a general guide to topography. Gaps may occur along contour lines due to vertical topography, obscured topography in the source photography such as buildings, dense vegetation or dead ground, or the fact that original buildings have been replaced in the intervening thirty years since the original contour capture.

Scale:	Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2024	Coordinate System: GDA 1994 MGA Zone 56	Date: 09 September 2024

Hydrogeology & Groundwater

Hornby Lighthouse, Watsons Bay, NSW 2192

Hydrogeology

Description of aquifers within the dataset buffer:

Description	Distance	Direction
Porous, extensive aquifers of low to moderate productivity	581m	South

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)
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Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018

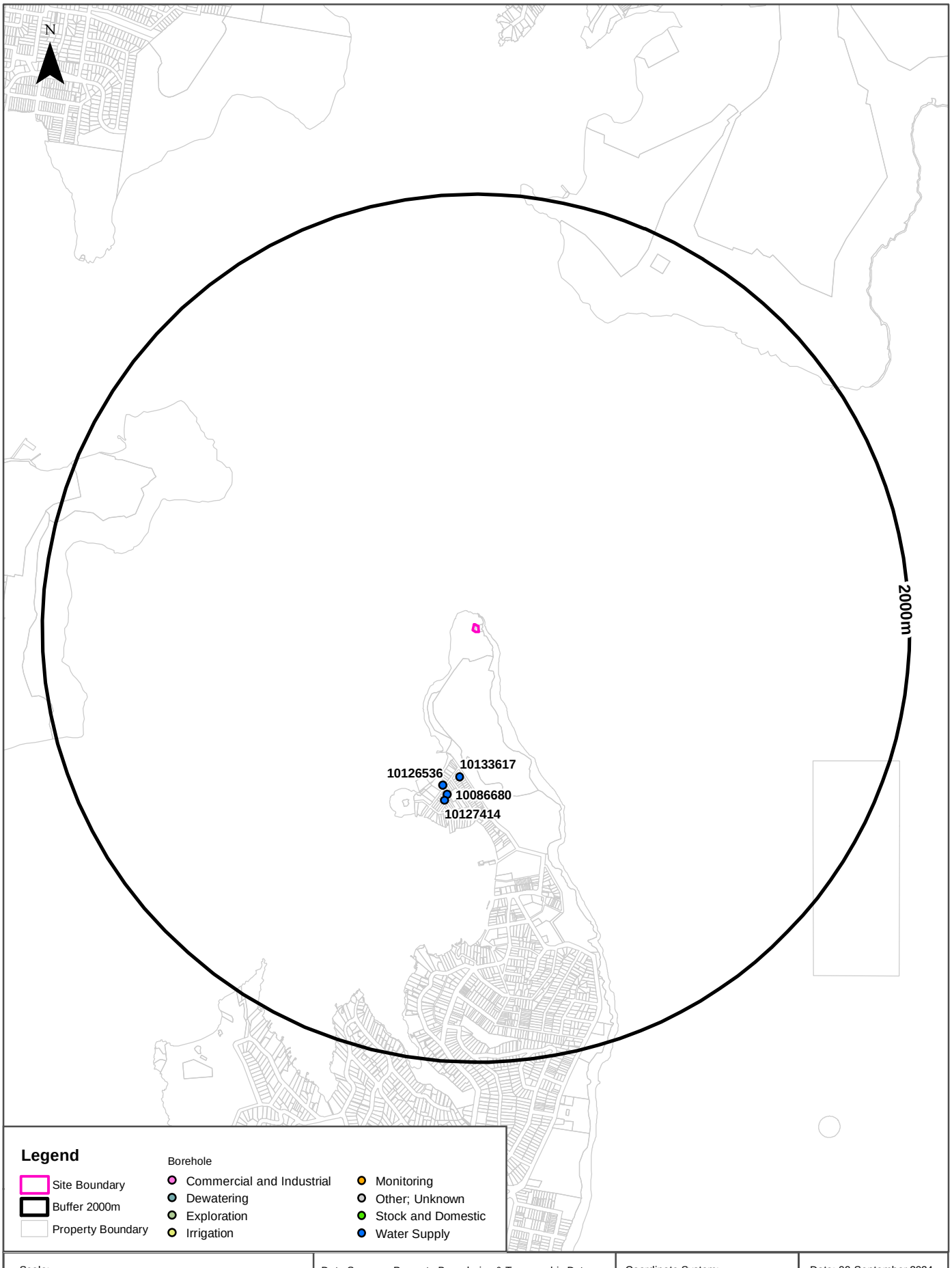
Temporary water restrictions relating to the Botany Sands aquifer within the dataset buffer:

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

Groundwater Boreholes

Hornby Lighthouse, Watsons Bay, NSW 2192



Hydrogeology & Groundwater

Hornby Lighthouse, Watsons Bay, NSW 2192

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
10133617	GW102174	Water Supply	Functioning	01/12/1995	2.00		AHD			1.50	678m	South
10126536	GW107752	Water Supply	Functioning	01/12/2005	6.00		AHD		1.000	5.50	730m	South
10086680	GW111894	Water Supply	Functioning	01/09/2012	6.00		AHD		1.000	3.00	766m	South
10127414	GW111436	Water Supply	Functioning	02/06/2007	7.00		AHD		1.000		797m	South

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

Hornby Lighthouse, Watsons Bay, NSW 2192

Driller's Logs

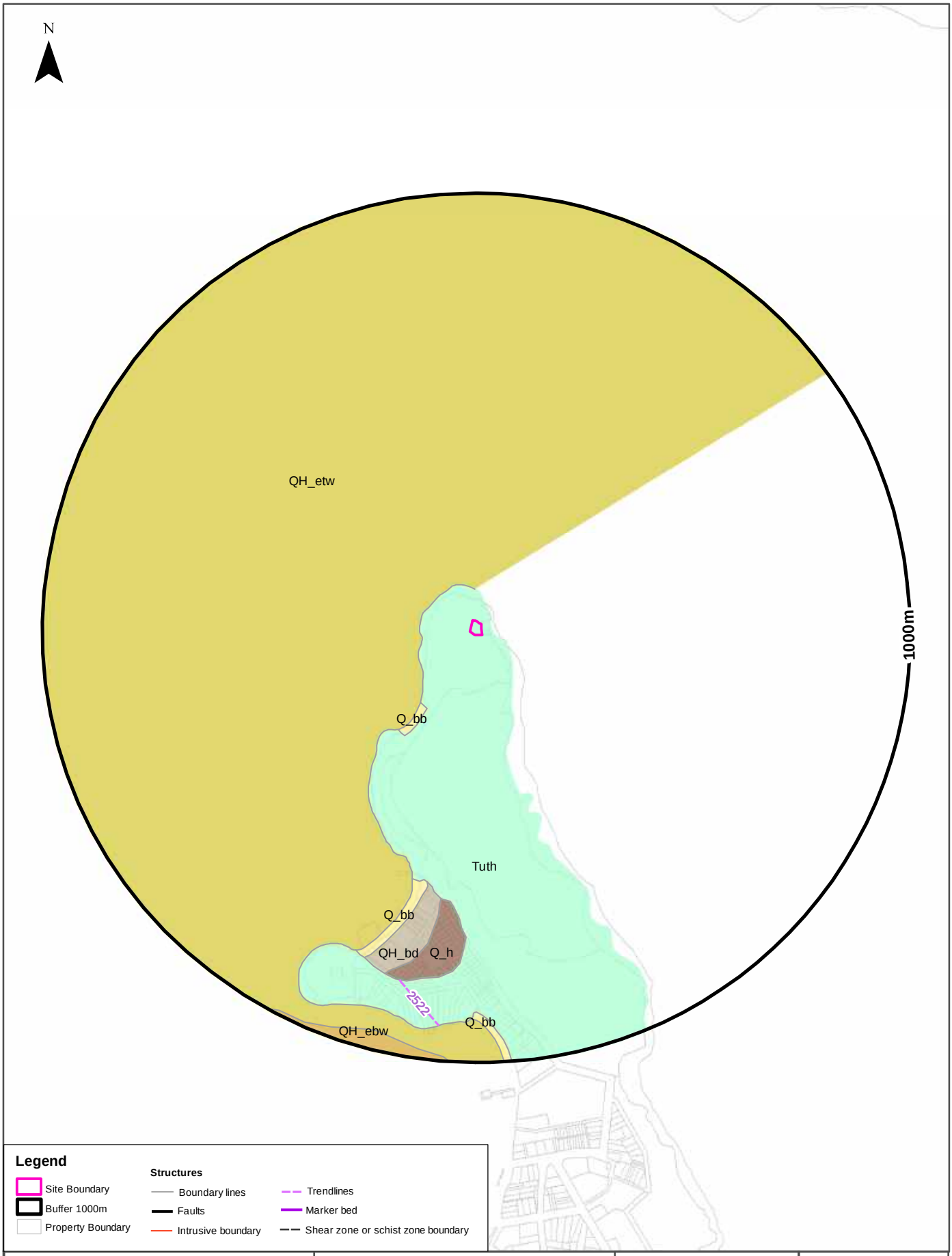
Drill log data relevant to the boreholes within the dataset buffer:

NGIS Bore ID	Drillers Log	Distance	Direction
10126536	0.00m-7.00m Sand, unconsolidated	730m	South
10127414	0.00m-7.00m ALL SAND AND PEAT UNCONSOLIDATED	797m	South

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

Hornby Lighthouse, Watsons Bay, NSW 2192



Geology

Hornby Lighthouse, Watsons Bay, NSW 2192

Geological Units

What are the Geological Units within the dataset buffer?

Unit Code	Unit Name	Description	Unit Stratigraphy	Age	Dominant Lithology	Distance
Tuth	Hawkesbury Sandstone	Medium- to coarse-grained quartz sandstone with minor shale and laminite lenses.	\Ungrouped Triassic units\\Hawkesbury Sandstone\\	Anisian (base) to Anisian (top)	Sandstone	0m
QH_etw	Estuarine tidal delta flat (subaqueous)	Fine- to medium-grained lithic-carbonate-quartz sand (marine-deposited), silt, clay, shell material, polymictic gravel.	\Estuarine deposits\ \Estuarine tidal-delta flat \Estuarine tidal delta flat (subaqueous)\	Holocene (base) to Now (top)	Clastic sediment	74m
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	202m
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	588m
Q_h	Anthropogenic deposits	Anthropocene deposits varying from large man-made clasts (concrete blocks to building demolition rubble) to quarried natural boulders, with interstitial sand-sized to clay matrix.	\Anthropogenic deposits\ \\\	Quaternary (base) to Now (top)	Anthropogenic material	622m
QH_ebw	Estuarine basin and bay (subaqueous)	Clay, silt, shell, very fine- to fine-grained lithic-quartz (± carbonate) sand (fluvially- and/or marine-deposited).	\Estuarine deposits\ \Estuarine basin and bay \Estuarine basin and bay (subaqueous)\	Holocene (base) to Now (top)	Clastic sediment	954m

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
2522	Dyke or vein	Sydney 1:100,000 Geological Sheet	825m

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

Hornby Lighthouse, Watsons Bay, NSW 2192

Naturally Occurring Asbestos Potential

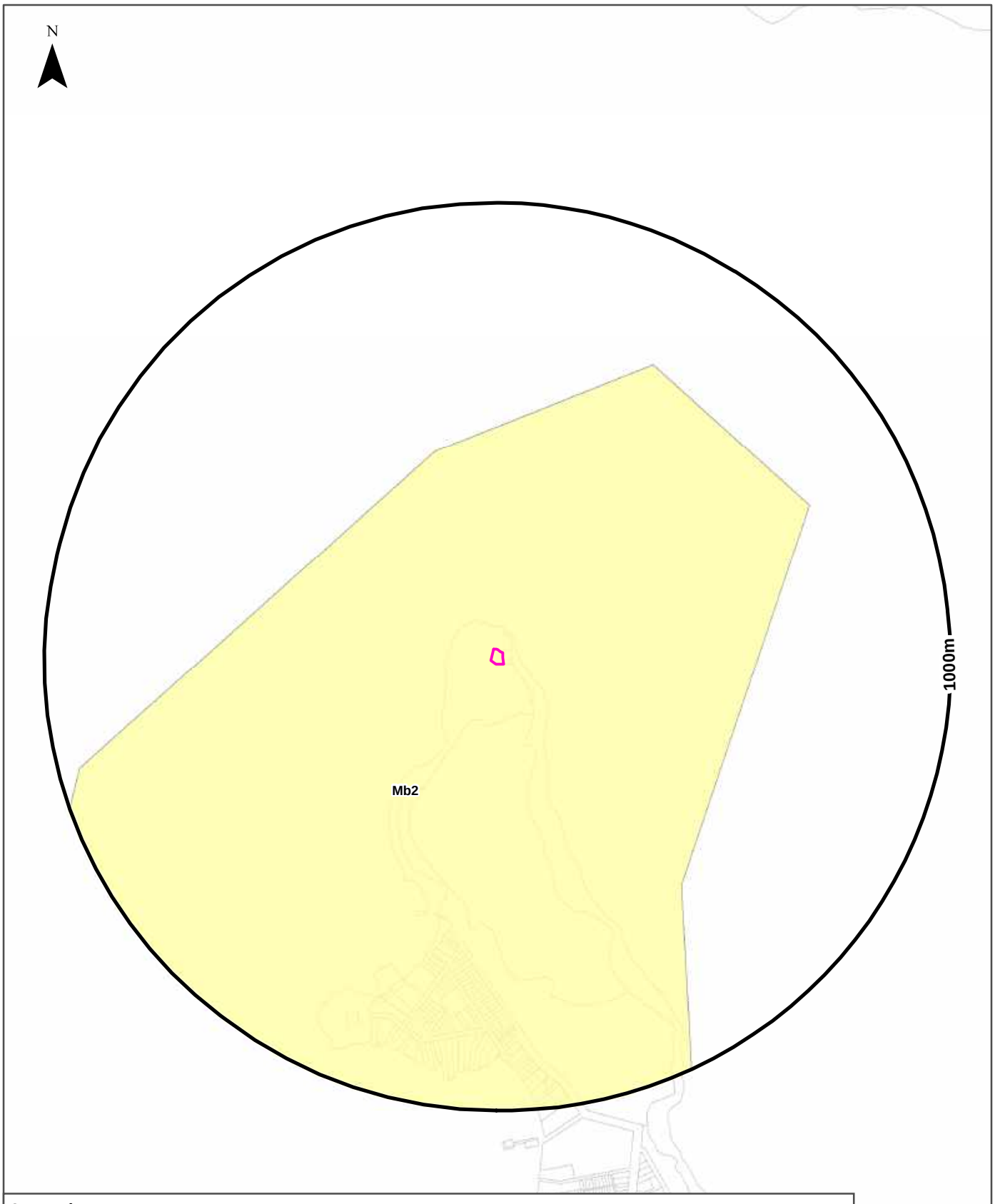
Naturally Occurring Asbestos Potential within the dataset buffer:

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

Atlas of Australian Soils

Hornby Lighthouse, Watsons Bay, NSW 2192



Soils

Hornby Lighthouse, Watsons Bay, NSW 2192

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
Mb2	Kandosol	Dissected sandstone plateau of moderate to strong relief with sandstone pillars, ledges, and slabs-- level to undulating ridges, irregularly benched slopes, steep ridges, cliffs, canyons, narrow sandy valleys: chief soils are (i) on areas of gentle to moderate relief, acid yellow leached earths (Gn2.74) and (Gn2.34) and acid leached yellow earths (Gn2.24)- sometimes these soils contain ironstone gravel; and (ii) on, or adjacent to, areas of strong relief, siliceous sands (Uc1.2), leached sands (Uc2.12) and (Uc2.2), and shallow forms of the above (Gn2) soils. Associated are: (i) on flat to gently undulating remnants of the original plateau surface, leached sands (Uc2.3), siliceous sands (Uc1.2), sandy earths (Uc5.22), and (Gn2) soils as for (i) above (these areas are in part comparable with unit Cb29); (ii) on flat ironstone gravelly remnants of the original plateau surface, (Gn2) soils as for unit Mb5(i); (iii) on gently undulating ridges where interbedded shales are exposed, shallow, often stony (Dy3.41), (Dr2.21), and related soils similar to unit Tb35; (iv) narrow valleys of (Uc2.3) soils flanked by moderate slopes of (Dy3.41) soils; (v) escarpments of steep hills with shallow (Dy) and (Dr) soils between sandstone pillars; and (vi) shallow (Um) soils, such as (Um6.21) on steep hills of basic rocks. As mapped, minor areas of units Mg20, Mm1, and Mw8 are included. Data are limited.	0m	On-site

Atlas of Australian Soils Data Source: CSIRO

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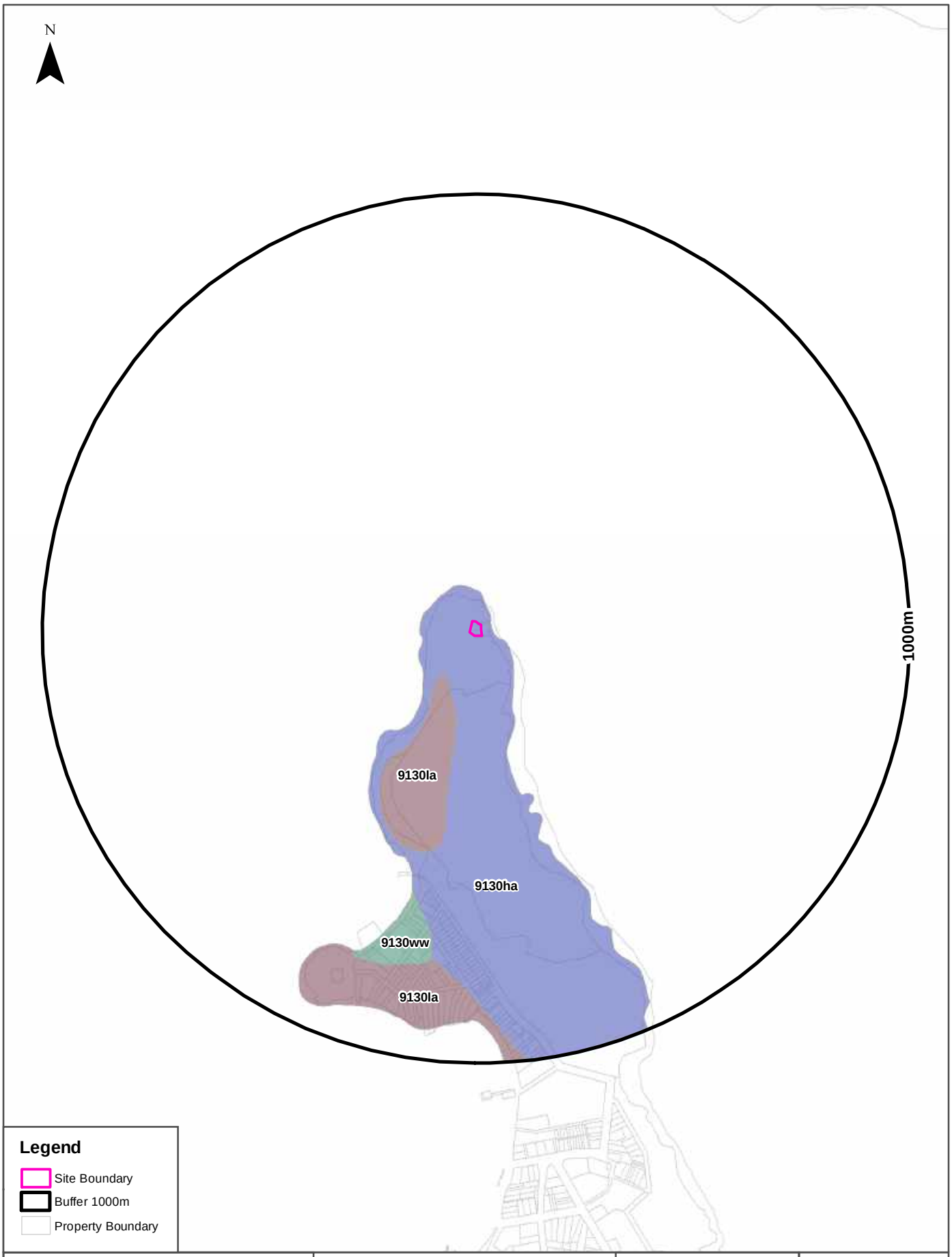
Soil Landscapes of Central and Eastern NSW

Hornby Lighthouse, Watsons Bay, NSW 2192



Soils

Hornby Lighthouse, Watsons Bay, NSW 2192

Soil Landscapes of Central and Eastern NSW

Soil Landscapes of Central and Eastern NSW within the dataset buffer:

Soil Code	Name	Distance	Direction
9130ha	Hawkesbury	0m	On-site
9130la	Lambert	113m	South
9130ww	Woy Woy	616m	South

Soil Landscapes of Central and Eastern NSW: NSW Department of Planning, Industry and Environment
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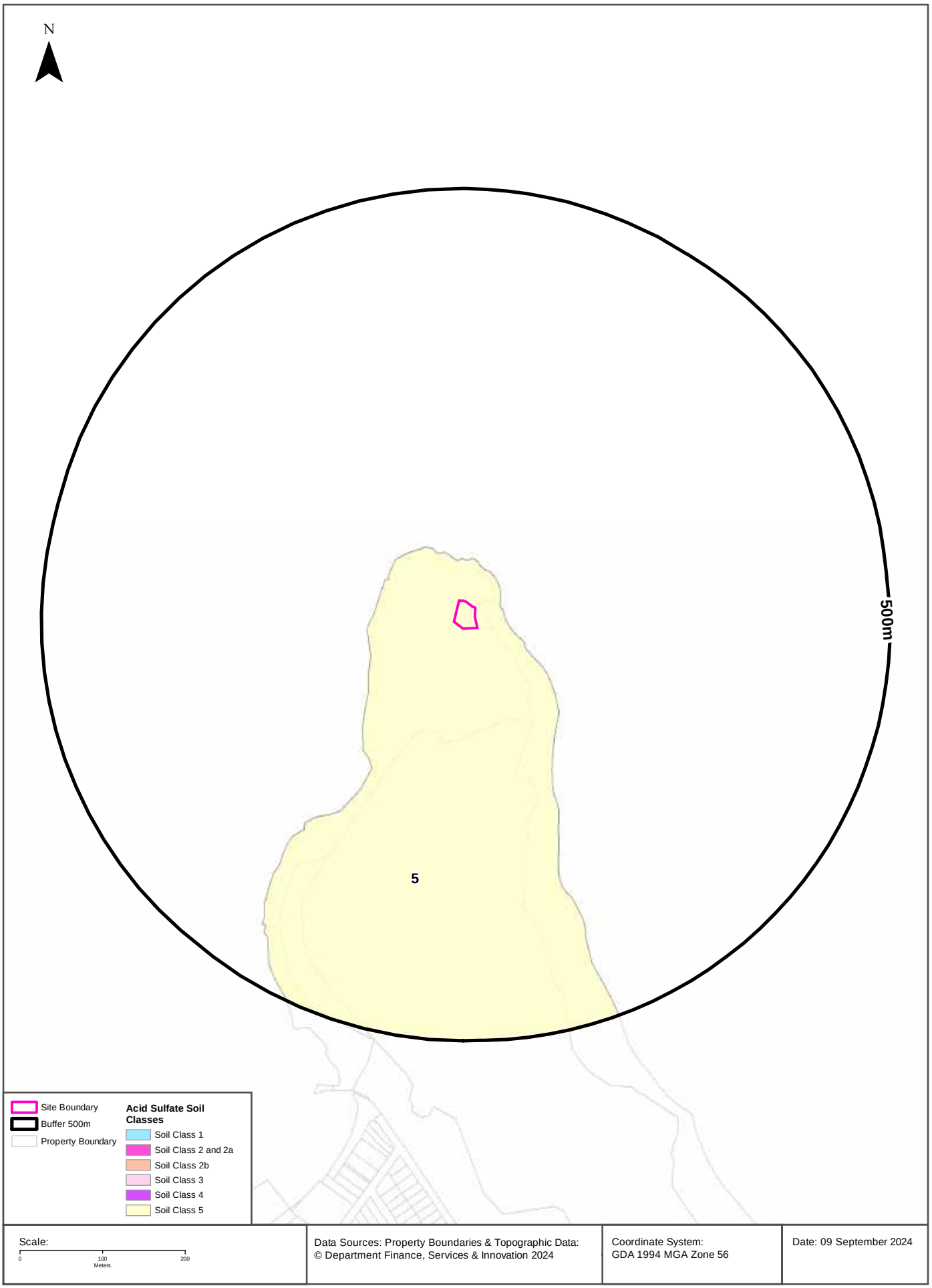
Acid Sulfate Soils

Hornby Lighthouse, Watsons Bay, NSW 2192



Acid Sulfate Soils

Hornby Lighthouse, Watsons Bay, NSW 2192

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
5	Works within 500 metres of adjacent Class 1, 2, 3, or 4 land that is below 5 metres AHD and by which the watertable is likely to be lowered below 1 metre AHD on adjacent Class 1, 2, 3 or 4 land, present an environmental risk	Woollahra Local Environmental Plan 2014

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

Soil Class	Description	EPI Name	Distance	Direction
None				

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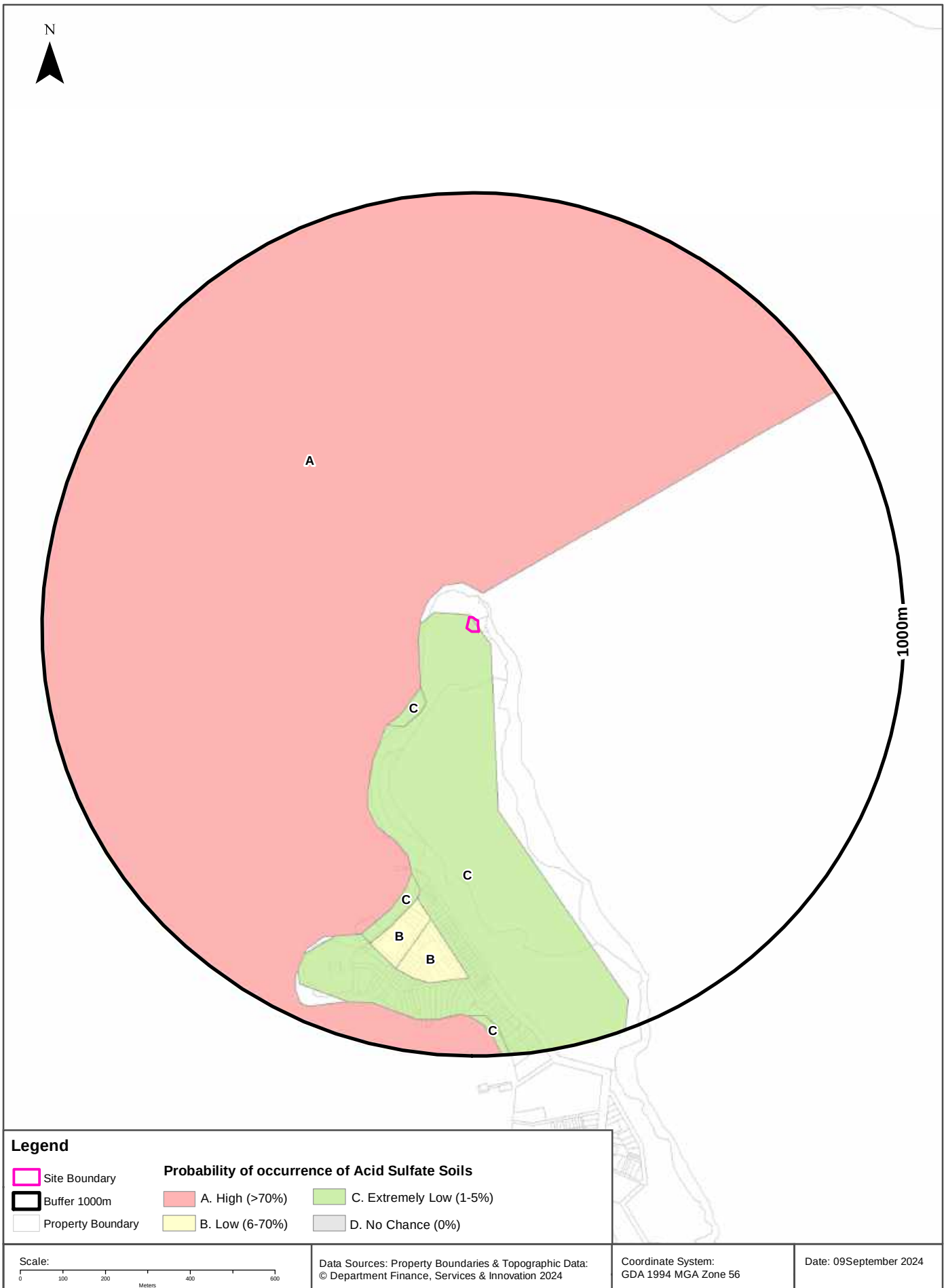
Atlas of Australian Acid Sulfate Soils

Hornby Lighthouse, Watsons Bay, NSW 2192



Acid Sulfate Soils

Hornby Lighthouse, Watsons Bay, NSW 2192

Atlas of Australian Acid Sulfate Soils

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

Class	Description	Distance	Direction
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m	On-site
A	High Probability of occurrence. >70% chance of occurrence.	62m	North West
B	Low Probability of occurrence. 6-70% chance of occurrence.	643m	South

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO
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Dryland Salinity

Hornby Lighthouse, Watsons Bay, NSW 2192

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

Hornby Lighthouse, Watsons Bay, NSW 2192

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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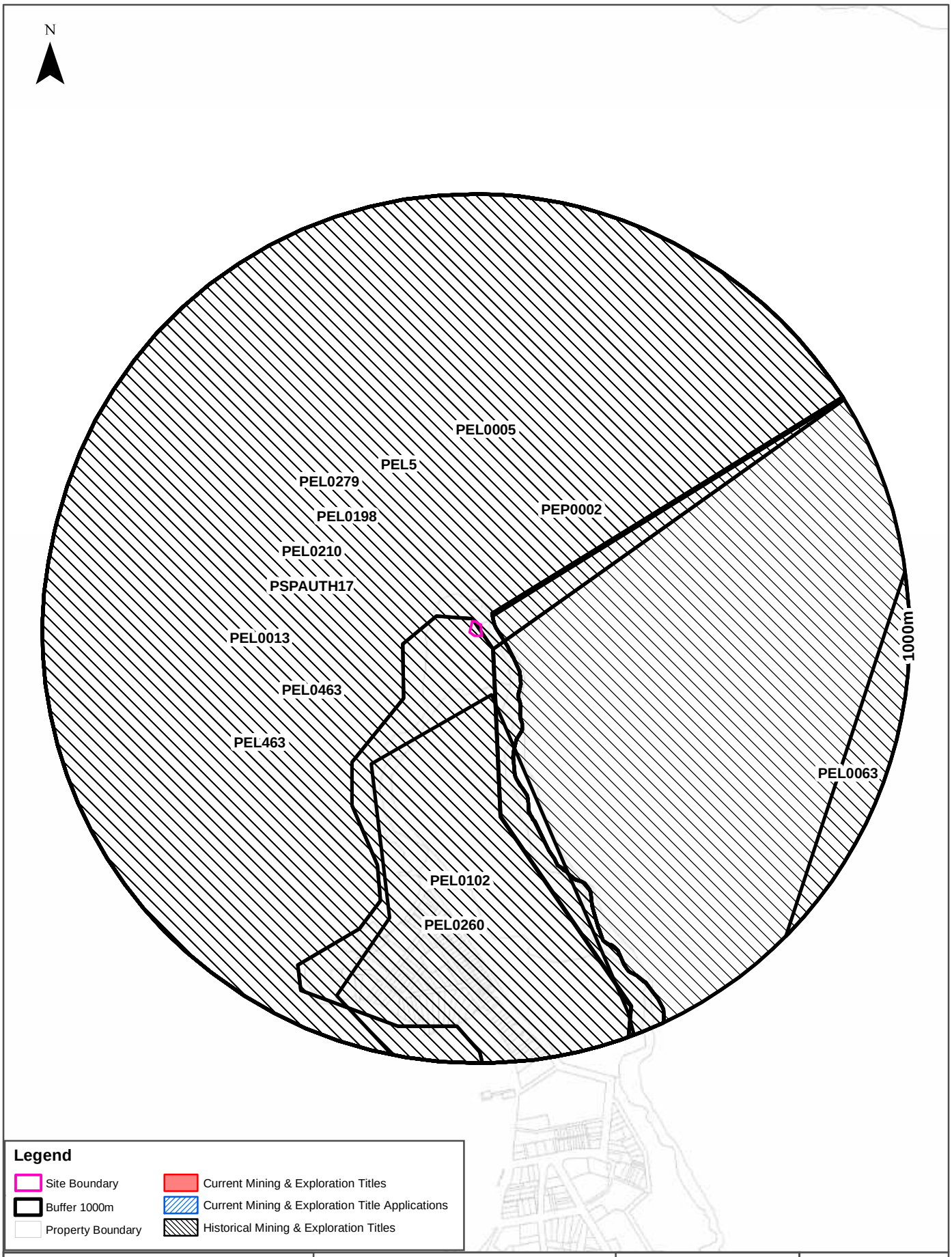
Mining & Exploration Titles

Hornby Lighthouse, Watsons Bay, NSW 2192



Mining

Hornby Lighthouse, Watsons Bay, NSW 2192

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

Hornby Lighthouse, Watsons Bay, NSW 2192

Historical Mining & Exploration Titles

Historical Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Start Date	End Date	Resource	Minerals	Dist	Dir
PSPAUTH17	MACQUARIE ENERGY PTY LTD	20070803	20080703	PETROLEUM	Petroleum	0m	On-site
PEL0013	AUSTRALIAN OIL AND GAS CORPORATION LTD			PETROLEUM	Petroleum	0m	On-site
PEL0102	AUSTRALIAN OIL AND GAS CORPORATION LTD			PETROLEUM	Petroleum	0m	On-site
PEL0260	NORTH BULLI COLLIERIES PTY LTD, AGL PETROLEUM OPERATIONS PTY LTD, THE AUSTRALIAN GAS LIGHT CO.	19810909	19930803	PETROLEUM	Petroleum	0m	On-site
PEL0463	DART ENERGY (APOLLO) PTY LTD	20091010	20150603	PETROLEUM	Petroleum	0m	On-site
PEL0005	AGL UPSTREAM INVESTMENTS PTY LIMITED	19931111	20150403	PETROLEUM	Petroleum	0m	On-site
PEL0198	JOHN STREVENS (TERRIGAL) NL			PETROLEUM	Petroleum	0m	On-site
PEL463	DART ENERGY (APOLLO) PTY LTD	20081022	20130227	MINERALS		0m	On-site
PEL5	AGL UPSTREAM INVESTMENTS PTY LIMITED	19931111	20011210	MINERALS		0m	On-site
PEL0279	THE ELECTRICITY COMMISSION OF NSW (TRADING AS PACIFIC POWER)	19910504	19931111	PETROLEUM	Petroleum	0m	On-site
PEL0210	THE AUSTRALIAN GAS LIGHT COMPANY (AGL), NORTH BULLI COLLIERIES PTY LTD			PETROLEUM	Petroleum	0m	On-site
PEP0002	LASKAN MINERALS LTD			PETROLEUM	Petroleum	0m	On-site
PEL0063	L H SMART OIL EXPLORATION CO. LTD			PETROLEUM	Petroleum	894m	East

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

State Environmental Planning Policy

Hornby Lighthouse, Watsons Bay, NSW 2192

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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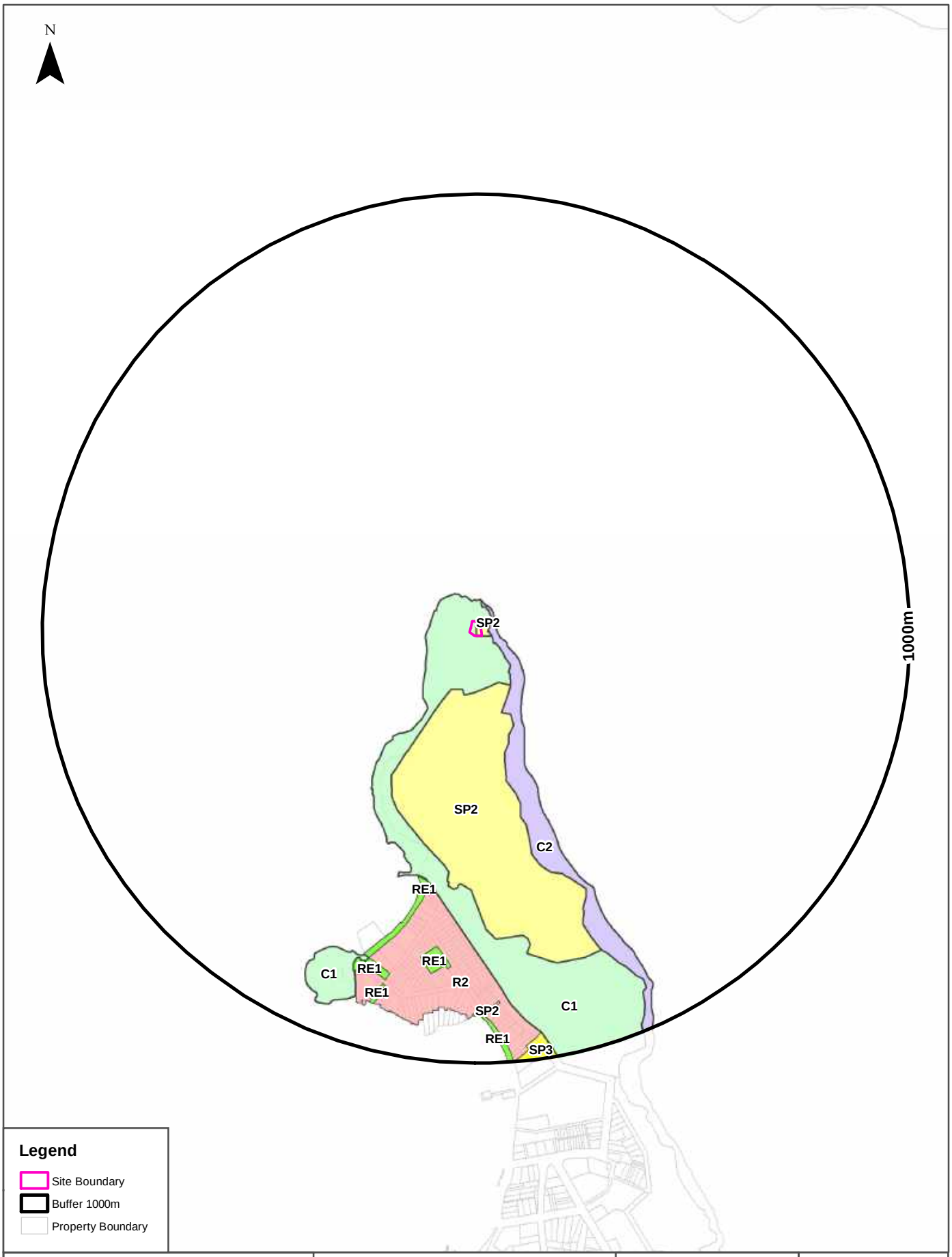
EPI Planning Zones

Hornby Lighthouse, Watsons Bay, NSW 2192



Environmental Planning Instrument

Hornby Lighthouse, Watsons Bay, NSW 2192

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
SP2	Infrastructure	Navigation & Emergency Response Facility	Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	0m	On-site
C1	National Parks and Nature Reserves		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	0m	On-site
C2	Environmental Conservation		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	14m	South
SP2	Infrastructure	Defence	Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	116m	South
RE1	Public Recreation		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	579m	South
R2	Low Density Residential		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	601m	South
RE1	Public Recreation		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	731m	South
C1	National Parks and Nature Reserves		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	789m	South West
RE1	Public Recreation		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	794m	South
RE1	Public Recreation		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	842m	South
SP2	Infrastructure	Sewerage System	Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	856m	South
RE1	Public Recreation		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	878m	South
SP3	Tourist		Woollahra Local Environmental Plan 2014	14/04/2023	26/04/2023	26/04/2023	Map Amendment No 2	937m	South

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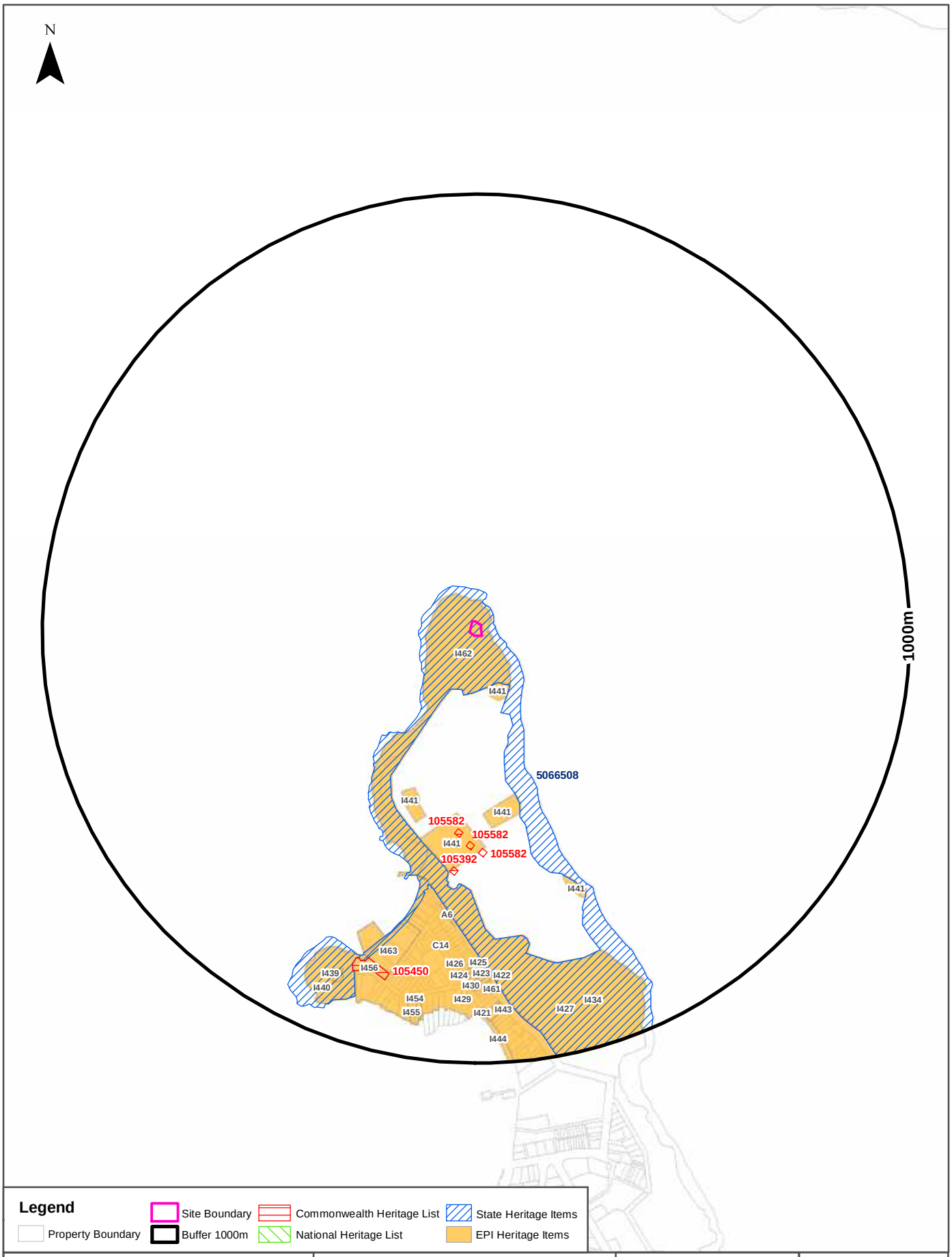
Heritage Items

Hornby Lighthouse, Watsons Bay, NSW 2192



Heritage

Hornby Lighthouse, Watsons Bay, NSW 2192

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
105582	Barracks Group HMAS Watson	Hornby Light Rd, Watsons Bay NSW	1/12/041/0139	Historic	Listed place	22/06/2004	453m	South
105392	Cliff House	Hornby Light Rd, HMAS Watson, Watsons Bay NSW	1/12/041/0026	Historic	Listed place	22/06/2004	543m	South
105450	Marine Biological Station (former)	31 Pacific St, Watsons Bay NSW	1/12/041/0049	Historic	Listed place	22/06/2004	794m	South

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

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
5066508	South Head Cultural Landscape (including RMP 9-inch 12-ton gun)	Cliff Street Watsons Bay	WOOLLAHRA	13/01/2023	02071	3306	0m	On-site

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
C14	Watsons Bay Heritage Conservation Area	Conservation Area - General	Local	Woollahra Local Environmental Plan 2014	23/01/2015	23/05/2015	19/07/2024	0m	On-site

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
I462	Hornby Lighthouse group	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	0m	On-site
I441	South Head Artillery Barracks group	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	116m	South
I441	South Head Artillery Barracks group	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	377m	South
I441	South Head Artillery Barracks group	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	381m	South
I441	South Head Artillery Barracks group	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	417m	South
I427	Constable's Cottage Group,comprising Police Station and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	511m	South
I434	Gunnery School group	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	511m	South
I441	South Head Artillery Barracks group	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	587m	South
A6	Cobbled sandstone road archaeology	Item - Archaeological	Local	Woollahra Local Environmental Plan 2014	23/01/2015	23/05/2015	19/07/2024	629m	South
I463	Camp Cove Beach	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	684m	South
I426	Cottage and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	754m	South
I425	Isabel - Cottage and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	763m	South
I424	Doo-Mee - Cottage and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	771m	South
I433	Cottage and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	777m	South
I423	Cottage and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	780m	South
I432	Cottage and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	786m	South
I439	Green (Laings) Point Battery	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	789m	South West
I440	Green Point Obelisk	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	789m	South West
I456	Former Marine Biology Station - building, interiors and grounds	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	794m	South
I431	Cottage and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	794m	South
I422	Cottage and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	797m	South
I430	House and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	802m	South
I429	Cottage and interiors	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	810m	South

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
I461	Cottage and interiors, street fencing	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	818m	South
I454	Caldale - house, interiors and grounds	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	852m	South
I455	Boongaree - house, interiors and grounds	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	856m	South
I421	Sydney Water pumping station and internal elements	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	856m	South
I443	Mandalay - house and interiors, fencing to Marine Parade	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	860m	South
I444	Promenade	Item - General	Local	Woollahra Local Environmental Plan 2014	28/07/2023	28/07/2023	19/07/2024	878m	South

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Natural Hazards

Hornby Lighthouse, Watsons Bay, NSW 2192

Bush Fire Prone Land

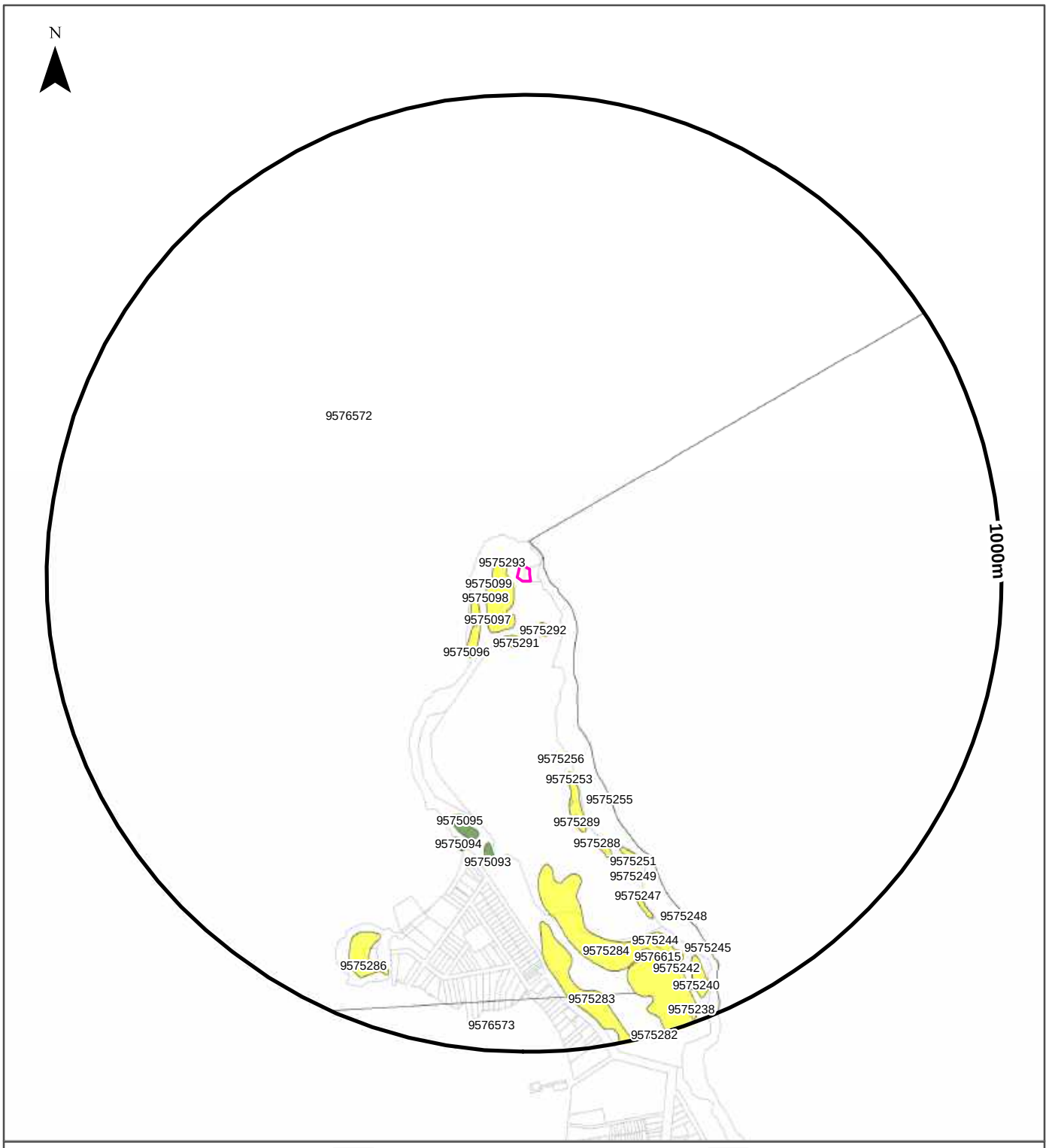
What are the nearest Bush Fire Prone Land Categories that exist within the dataset buffer?

Bush Fire Prone Land Category	Distance	Direction
No records in buffer		

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

Ecological Constraints - Vegetation & Ramsar Wetlands

Hornby Lighthouse, Watsons Bay, NSW 2192



- Site Boundary
- ReportBuffer
- Property Boundary
- Ramsar Wetland

Native Vegetation

- Alpine Complex
- Arid Shrublands (Acacia sub-formation)
- Arid Shrublands (Chenopod sub-formation)
- Dry Sclerophyll Forests (Shrub/grass sub-formation)
- Dry Sclerophyll Forests (Shrubby sub-formation)
- Forested Wetlands
- Freshwater Wetlands
- Grasslands
- Grassy Woodlands
- Heathlands
- Rainforests
- Saline Wetlands
- Semi-arid Woodlands (Grassy sub-formation)
- Semi-arid Woodlands (Shrubby sub-formation)
- Wet Sclerophyll Forests (Grassy sub-formation)
- Wet Sclerophyll Forests (Shrubby sub-formation)
- Non vegetated
- Unattributed
- Not classified
- Other

Scale: 0 100 200 400 600 Meters

Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2024

Coordinate System: GDA 1994 MGA Zone 56

Date: 09 September 2024

Ecological Constraints

Hornby Lighthouse, Watsons Bay, NSW 2192

Native Vegetation

What native vegetation exists within the dataset buffer?

Map ID	Vegetation Formation	Plant Community Type and Vegetation Formation	Vegetation Class	Dist	Dir
9576572	Not classified	(Not classified) Not classified	Not classified	0m	On-site
9575293	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	16m	South West
9575091	Not classified	(Not classified) Not classified	Not classified	34m	North East
9575099	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	60m	West
9575098	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	73m	South West
9575292	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	91m	South
9575096	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	95m	South West
9575097	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	105m	South West
9575291	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	118m	South
9575256	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	376m	South
9575253	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	415m	South
9575290	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	466m	South
9575255	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	483m	South
9575289	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	506m	South
9575095	Dry Sclerophyll Forests (Shrubby sub-formation)	(Dry Sclerophyll Forests (Shrubby sub-formation)) Sydney Coastal Sandstone Foreshores Forest	Sydney Coastal Dry Sclerophyll Forests	514m	South
9575254	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	534m	South
9575252	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	542m	South
9575093	Dry Sclerophyll Forests (Shrubby sub-formation)	(Dry Sclerophyll Forests (Shrubby sub-formation)) Sydney Coastal Sandstone Foreshores Forest	Sydney Coastal Dry Sclerophyll Forests	562m	South
9575094	Dry Sclerophyll Forests (Shrubby sub-formation)	(Dry Sclerophyll Forests (Shrubby sub-formation)) Sydney Coastal Sandstone Foreshores Forest	Sydney Coastal Dry Sclerophyll Forests	564m	South
9575288	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	567m	South
9575251	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	597m	South
9575284	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	604m	South
9575250	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	615m	South East
9575287	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	652m	South
9575249	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	654m	South
9575247	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	695m	South
9575283	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	724m	South
9575248	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	747m	South East

Map ID	Vegetation Formation	Plant Community Type and Vegetation Formation	Vegetation Class	Dist	Dir
9575244	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	792m	South
9575246	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	806m	South East
9575286	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	810m	South West
9576614	Not classified	(Not classified) Not classified	Not classified	819m	South
9576620	Not classified	(Not classified) Not classified	Not classified	832m	South
9576615	Not classified	(Not classified) Not classified	Not classified	840m	South
9576618	Not classified	(Not classified) Not classified	Not classified	840m	South
9576617	Not classified	(Not classified) Not classified	Not classified	846m	South
9575245	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	847m	South East
9576621	Not classified	(Not classified) Not classified	Not classified	853m	South
9575242	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	865m	South
9575240	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	867m	South East
9576573	Not classified	(Not classified) Not classified	Not classified	887m	South
9575243	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	896m	South East
9575285	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	909m	South East
9575241	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	945m	South East
9575238	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	961m	South
9575239	Heathlands	(Heathlands) Sydney Coastal Headland Cliff Scrub	Sydney Coastal Heaths	967m	South East
9575282	Heathlands	(Heathlands) Sydney Coastal Sandstone Headland Heath	Sydney Coastal Heaths	998m	South

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

Hornby Lighthouse, Watsons Bay, NSW 2192

Ramsar Wetlands

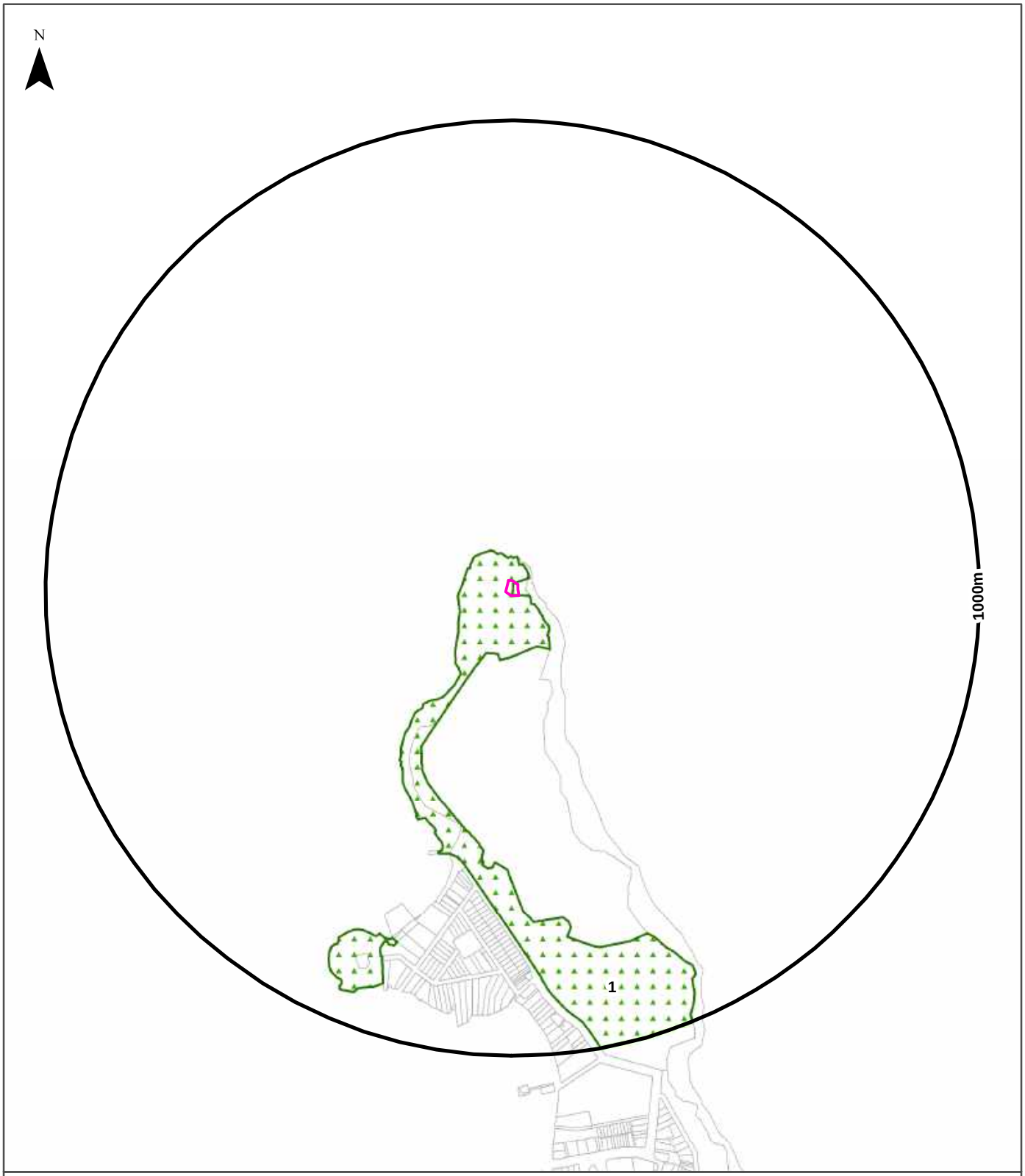
What Ramsar Wetland areas exist within the dataset buffer?

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 - Protected Areas

Hornby Lighthouse, Watsons Bay, NSW 2192



Legend

IUCN category

- Site Boundary
- Buffer 1000m
- Property Boundary
- Strict Nature Reserve
- Wilderness Area
- National Park
- Natural Monument or Feature
- Habitat/Species Management Area
- Protected Landscape/Seascape
- Protected area sustainable use of natural resources
- Uncategorised Protected Area

Scale: 0 100 200 400 Meters

Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2024

Coordinate System: GDA 1994 MGA Zone 56

Date: 09 September 2024

Ecological Constraints

Hornby Lighthouse, Watsons Bay, NSW 2192

Collaborative Australian Protected Areas Database - Terrestrial

Protected areas in terrestrial environments identified by the CAPAD within the dataset buffer:

Map ID	Area Name	Area Details	Management Category	Authority	Jurisdiction	Dist	Dir
1	Sydney Harbour	National Park	National Park	NSW Department of Planning and Environment	State	0m	On-site

Collaborative Australian Protected Areas Database - Marine

Protected areas in marine environments identified by the CAPAD within the dataset buffer:

Map ID	Area Name	Area Details	Management Category	Authority	Jurisdiction	Dist	Dir
N/A	No records in buffer						

Source: Collaborative Australian Protected Areas Database (CAPAD) 2022
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Ecological Constraints

Hornby Lighthouse, Watsons Bay, NSW 2192

Groundwater Dependent Ecosystems Atlas

Type	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
N/A	No records in buffer					

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology
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Ecological Constraints

Hornby Lighthouse, Watsons Bay, NSW 2192

Inflow Dependent Ecosystems Likelihood

Type	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
N/A	No records in buffer					

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology
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Ecological Constraints

Hornby Lighthouse, Watsons Bay, NSW 2192

NSW BioNet Species Sightings

Species sightings from the NSW BioNet Repository that have either a state or federal conservation status, or a sensitivity status, and are within 10 km of the site:
Note: This data does not include NSW Category 1 sensitive species.

Kingdom	Class	Scientific	Common	Sensitivity Class	State Conservation Status	Federal Conservation Status	Migratory Species Agreements
Animalia	Amphibia	Heleioporus australiacus	Giant Burrowing Frog	Not Sensitive	Vulnerable	Vulnerable	
Animalia	Amphibia	Litoria aurea	Green and Golden Bell Frog	Not Sensitive	Endangered	Vulnerable	
Animalia	Amphibia	Pseudophryne australis	Red-crowned Toadlet	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Actitis hypoleucos	Common Sandpiper	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Anous stolidus	Common Noddy	Not Sensitive	Not Listed	Not Listed	CAMBA;JAMBA
Animalia	Aves	Anseranas semipalmata	Magpie Goose	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Anthochaera phrygia	Regent Honeyeater	Category 2	Critically Endangered	Critically Endangered	
Animalia	Aves	Apus pacificus	Fork-tailed Swift	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ardenna carneipes	Flesh-footed Shearwater	Not Sensitive	Vulnerable	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Ardenna grisea	Sooty Shearwater	Not Sensitive	Not Listed	Not Listed	JAMBA
Animalia	Aves	Ardenna pacifica	Wedge-tailed Shearwater	Not Sensitive	Not Listed	Not Listed	JAMBA
Animalia	Aves	Ardenna tenuirostris	Short-tailed Shearwater	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Arenaria interpres	Ruddy Turnstone	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Botaurus poiciloptilus	Australasian Bittern	Not Sensitive	Endangered	Endangered	
Animalia	Aves	Burhinus grallarius	Bush Stone-curlew	Not Sensitive	Endangered	Not Listed	
Animalia	Aves	Calidris acuminata	Sharp-tailed Sandpiper	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris alba	Sanderling	Not Sensitive	Vulnerable	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris ferruginea	Curlew Sandpiper	Not Sensitive	Critically Endangered	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris melanotos	Pectoral Sandpiper	Not Sensitive	Not Listed	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Calidris ruficollis	Red-necked Stint	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris tenuirostris	Great Knot	Not Sensitive	Vulnerable	Vulnerable	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	Category 3	Endangered	Endangered	
Animalia	Aves	Calonectris leucomelas	Streaked Shearwater	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calyptorhynchus banksii banksii	Red-tailed Black-Cockatoo (coastal subspecies)	Category 2	Critically Endangered	Not Listed	
Animalia	Aves	Calyptorhynchus banksii samueli	Red-tailed Black-Cockatoo (inland subspecies)	Category 2	Vulnerable	Not Listed	

Kingdom	Class	Scientific	Common	Sensitivity Class	State Conservation Status	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	Category 2	Vulnerable	Vulnerable	
Animalia	Aves	Chthonicola sagittata	Speckled Warbler	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Cinclosoma castanotum	Chestnut Quail-thrush	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Not Sensitive	Vulnerable	Vulnerable	
Animalia	Aves	Cuculus optatus	Oriental Cuckoo	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Daphoenositta chrysoptera	Varied Sittella	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Diomedea exulans	Wandering Albatross	Not Sensitive	Endangered	Vulnerable	
Animalia	Aves	Epthianura albifrons	White-fronted Chat	Not Sensitive	Endangered Population, Vulnerable	Not Listed	
Animalia	Aves	Erythrotriorchis radiatus	Red Goshawk	Category 2	Endangered	Endangered	
Animalia	Aves	Esacus magnirostris	Beach Stone-curlew	Not Sensitive	Critically Endangered	Not Listed	
Animalia	Aves	Eudyptula minor	Little Penguin	Not Sensitive	Endangered Population	Not Listed	
Animalia	Aves	Falco subniger	Black Falcon	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Fregata ariel	Lesser Frigatebird	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Gallinago hardwickii	Latham's Snipe	Not Sensitive	Vulnerable	Vulnerable	ROKAMBA;JAMBA
Animalia	Aves	Glossopsitta pusilla	Little Lorikeet	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Haematopus fuliginosus	Sooty Oystercatcher	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Haematopus longirostris	Pied Oystercatcher	Not Sensitive	Endangered	Not Listed	
Animalia	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Hieraaetus morphnoides	Little Eagle	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Hirundapus caudacutus	White-throated Needletail	Not Sensitive	Vulnerable	Vulnerable	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Hydroprogne caspia	Caspian Tern	Not Sensitive	Not Listed	Not Listed	JAMBA
Animalia	Aves	Ixobrychus flavicollis	Black Bittern	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Lathamus discolor	Swift Parrot	Not Sensitive	Endangered	Critically Endangered	
Animalia	Aves	Limosa lapponica	Bar-tailed Godwit	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Lophoictinia isura	Square-tailed Kite	Category 3	Vulnerable	Not Listed	
Animalia	Aves	Macronectes giganteus	Southern Giant Petrel	Not Sensitive	Endangered	Endangered	
Animalia	Aves	Menura alberti	Albert's Lyrebird	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Ninox connivens	Barking Owl	Category 3	Vulnerable	Not Listed	
Animalia	Aves	Ninox strenua	Powerful Owl	Category 3	Vulnerable	Not Listed	
Animalia	Aves	Numenius madagascariensis	Eastern Curlew	Not Sensitive	Not Listed	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Numenius minutus	Little Curlew	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Numenius phaeopus	Whimbrel	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA

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Animalia	Aves	Onychoprion fuscata	Sooty Tern	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Oxyura australis	Blue-billed Duck	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Pandion cristatus	Eastern Osprey	Category 3	Vulnerable	Not Listed	
Animalia	Aves	Petroica boodang	Scarlet Robin	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Petroica phoenicea	Flame Robin	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Phaethon lepturus	White-tailed Tropicbird	Not Sensitive	Not Listed	Not Listed	CAMBA;JAMBA
Animalia	Aves	Phaethon rubricauda	Red-tailed Tropicbird	Not Sensitive	Vulnerable	Not Listed	CAMBA;JAMBA
Animalia	Aves	Philomachus pugnax	Ruff	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Phoebetria fusca	Sooty Albatross	Not Sensitive	Vulnerable	Vulnerable	
Animalia	Aves	Pluvialis squatarola	Grey Plover	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Pterodroma leucoptera leucoptera	Gould's Petrel	Not Sensitive	Vulnerable	Endangered	
Animalia	Aves	Pterodroma nigripennis	Black-winged Petrel	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Pterodroma solandri	Providence Petrel	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Ptilinopus magnificus	Wompoo Fruit-Dove	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Ptilinopus regina	Rose-crowned Fruit-Dove	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Ptilinopus superbus	Superb Fruit-Dove	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Puffinus assimilis	Little Shearwater	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Stagonopleura guttata	Diamond Firetail	Not Sensitive	Vulnerable	Vulnerable	
Animalia	Aves	Stercorarius longicaudus	Long-tailed Jaeger	Not Sensitive	Not Listed	Not Listed	CAMBA;JAMBA
Animalia	Aves	Stercorarius maccormicki	South Polar Skua	Not Sensitive	Not Listed	Not Listed	JAMBA
Animalia	Aves	Stercorarius parasiticus	Arctic Jaeger	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Stercorarius pomarinus	Pomarine Jaeger	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Sterna hirundo	Common Tern	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Sternula albifrons	Little Tern	Not Sensitive	Endangered	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Sula dactylatra	Masked Booby	Not Sensitive	Vulnerable	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Thalassarche bulleri	Buller's Albatross	Not Sensitive	Not Listed	Vulnerable	
Animalia	Aves	Thalassarche cauta	Shy Albatross	Not Sensitive	Endangered	Endangered	
Animalia	Aves	Thalassarche chrysostoma	Grey-headed Albatross	Not Sensitive	Not Listed	Endangered	
Animalia	Aves	Thalassarche melanophris	Black-browed Albatross	Not Sensitive	Vulnerable	Vulnerable	
Animalia	Aves	Thalasseus bergii	Crested Tern	Not Sensitive	Not Listed	Not Listed	JAMBA
Animalia	Aves	Thinornis cucullatus cucullatus	Eastern Hooded Dotterel	Not Sensitive	Critically Endangered	Vulnerable	
Animalia	Aves	Todiramphus chloris	Collared Kingfisher	Not Sensitive	Vulnerable	Not Listed	
Animalia	Aves	Tringa incana	Wandering Tattler	Not Sensitive	Not Listed	Not Listed	JAMBA
Animalia	Aves	Tringa nebularia	Common Greenshank	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA;JAMBA

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Animalia	Aves	Tringa stagnatilis	Marsh Sandpiper	Not Sensitive	Not Listed	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Tyto novaehollandiae	Masked Owl	Category 3	Vulnerable	Not Listed	
Animalia	Aves	Tyto tenebricosa	Sooty Owl	Category 3	Vulnerable	Not Listed	
Animalia	Insecta	Petalura gigantea	Giant Dragonfly	Not Sensitive	Endangered	Not Listed	
Animalia	Mammalia	Aepyprymnus rufescens	Rufous Bettong	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Arctocephalus forsteri	New Zealand Fur-seal	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Arctocephalus pusillus doriferus	Australian Fur-seal	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Balaenoptera musculus	Blue Whale	Not Sensitive	Endangered	Endangered	
Animalia	Mammalia	Cercartetus nanus	Eastern Pygmy-possum	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Chalinolobus dwyeri	Large-eared Pied Bat	Not Sensitive	Endangered	Endangered	
Animalia	Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	Not Sensitive	Vulnerable	Endangered	
Animalia	Mammalia	Dasyurus viverrinus	Eastern Quoll	Not Sensitive	Endangered	Endangered	
Animalia	Mammalia	Dugong dugon	Dugong	Not Sensitive	Endangered	Not Listed	
Animalia	Mammalia	Eubalaena australis	Southern Right Whale	Not Sensitive	Endangered	Endangered	
Animalia	Mammalia	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Not Sensitive	Endangered	Endangered	
Animalia	Mammalia	Macrotis lagotis	Bilby	Not Sensitive	Extinct	Vulnerable	
Animalia	Mammalia	Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Miniopterus australis	Little Bent-winged Bat	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Myotis macropus	Southern Myotis	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Notomys cervinus	Fawn Hopping-mouse	Not Sensitive	Extinct	Not Listed	
Animalia	Mammalia	Notomys mitchellii	Mitchell's Hopping-mouse	Not Sensitive	Extinct	Not Listed	
Animalia	Mammalia	Perameles nasuta	Long-nosed Bandicoot	Not Sensitive	Endangered Population	Not Listed	
Animalia	Mammalia	Petaurus norfolcensis	Squirrel Glider	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Phascolarctos cinereus	Koala	Not Sensitive	Endangered	Endangered	
Animalia	Mammalia	Physeter macrocephalus	Sperm Whale	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Pseudomys hermannsburgensis	Sandy Inland Mouse	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Pseudomys novaehollandiae	New Holland Mouse	Not Sensitive	Not Listed	Vulnerable	
Animalia	Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	Not Sensitive	Vulnerable	Vulnerable	
Animalia	Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Scoteanax rueppellii	Greater Broad-nosed Bat	Not Sensitive	Vulnerable	Not Listed	
Animalia	Mammalia	Vespadelus troughtoni	Eastern Cave Bat	Not Sensitive	Vulnerable	Not Listed	

Kingdom	Class	Scientific	Common	Sensitivity Class	State Conservation Status	Federal Conservation Status	Migratory Species Agreements
Animalia	Reptilia	Aspidites ramsayi	Woma	Not Sensitive	Vulnerable	Not Listed	
Animalia	Reptilia	Caretta caretta	Loggerhead Turtle	Not Sensitive	Endangered	Endangered	
Animalia	Reptilia	Chelonia mydas	Green Turtle	Not Sensitive	Vulnerable	Vulnerable	
Animalia	Reptilia	Dermochelys coriacea	Leatherback Turtle	Not Sensitive	Endangered	Endangered	
Animalia	Reptilia	Diplodactylus platyurus	Eastern Fat-tailed Gecko	Not Sensitive	Endangered	Not Listed	
Animalia	Reptilia	Eretmochelys imbricata	Hawksbill Turtle	Not Sensitive	Not Listed	Vulnerable	
Animalia	Reptilia	Tiliqua occipitalis	Western Blue-tongued Lizard	Not Sensitive	Vulnerable	Not Listed	
Animalia	Reptilia	Uvidicolus sphyrurus	Border Thick-tailed Gecko	Not Sensitive	Vulnerable	Vulnerable	
Animalia	Reptilia	Varanus rosenbergi	Rosenberg's Goanna	Not Sensitive	Vulnerable	Not Listed	
Fungi	Flora	Camarophyllopsis kearneyi		Not Sensitive	Endangered	Not Listed	
Fungi	Flora	Hygrocybe aurantipes		Not Sensitive	Vulnerable	Not Listed	
Fungi	Flora	Hygrocybe austropratensis		Not Sensitive	Endangered	Not Listed	
Fungi	Flora	Hygrocybe collucera		Not Sensitive	Endangered	Not Listed	
Fungi	Flora	Hygrocybe griseoramosa		Not Sensitive	Endangered	Not Listed	
Fungi	Flora	Hygrocybe lanecovensis		Not Sensitive	Endangered	Not Listed	
Fungi	Flora	Hygrocybe reesiae		Not Sensitive	Vulnerable	Not Listed	
Plantae	Flora	Acacia bynoeana	Bynoe's Wattle	Not Sensitive	Endangered	Vulnerable	
Plantae	Flora	Acacia gordonii		Not Sensitive	Endangered	Endangered	
Plantae	Flora	Acacia terminalis subsp. Eastern Sydney	Sunshine wattle	Not Sensitive	Endangered	Endangered	
Plantae	Flora	Allocasuarina portuensis	Nielsen Park She-oak	Category 3	Endangered	Endangered	
Plantae	Flora	Amperea xiphoclada var. pedicellata		Not Sensitive	Extinct	Extinct	
Plantae	Flora	Asterolasia buxifolia		Not Sensitive	Critically Endangered	Critically Endangered	
Plantae	Flora	Baeckea kandos		Category 3	Endangered	Endangered	
Plantae	Flora	Caladenia tessellata	Thick Lip Spider Orchid	Category 2	Vulnerable	Vulnerable	
Plantae	Flora	Callistemon linearifolius	Netted Bottle Brush	Category 3	Vulnerable	Not Listed	
Plantae	Flora	Chamaesyce psammogeton	Sand Spurge	Not Sensitive	Endangered	Not Listed	
Plantae	Flora	Dichanthium setosum	Bluegrass	Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Doryanthes palmeri	Giant Spear Lily	Not Sensitive	Vulnerable	Not Listed	
Plantae	Flora	Epacris purpurascens var. purpurascens		Not Sensitive	Vulnerable	Not Listed	
Plantae	Flora	Eucalyptus camfieldii	Camfield's Stringybark	Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Eucalyptus fracta	Broken Back Ironbark	Not Sensitive	Vulnerable	Not Listed	
Plantae	Flora	Eucalyptus leucoxylon subsp. pruinosa	Yellow Gum	Not Sensitive	Vulnerable	Not Listed	
Plantae	Flora	Eucalyptus nicholii	Narrow-leaved Black Peppermint	Not Sensitive	Vulnerable	Vulnerable	

Kingdom	Class	Scientific	Common	Sensitivity Class	State Conservation Status	Federal Conservation Status	Migratory Species Agreements
Plantae	Flora	Eucalyptus pulverulenta	Silver-leafed Gum	Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Eucalyptus scoparia	Wallangarra White Gum	Not Sensitive	Endangered	Vulnerable	
Plantae	Flora	Euphrasia collina subsp. muelleri	Mueller's Eyebright	Not Sensitive	Endangered	Endangered	
Plantae	Flora	Grammitis stenophylla	Narrow-leaf Finger Fern	Category 3	Endangered	Not Listed	
Plantae	Flora	Grevillea caleyi	Caley's Grevillea	Category 3	Critically Endangered	Critically Endangered	
Plantae	Flora	Hibbertia puberula		Not Sensitive	Endangered	Not Listed	
Plantae	Flora	Hibbertia superans		Not Sensitive	Endangered	Not Listed	
Plantae	Flora	Lasiopetalum joyceae		Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Macadamia integrifolia	Macadamia Nut	Not Sensitive	Not Listed	Vulnerable	
Plantae	Flora	Macadamia tetraphylla	Rough-shelled Bush Nut	Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Melaleuca biconvexa	Biconvex Paperbark	Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Melaleuca deanei	Deane's Paperbark	Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Microtis angusii	Angus's Onion Orchid	Category 2	Endangered	Endangered	
Plantae	Flora	Persoonia hirsuta	Hairy Geebung	Category 3	Endangered	Endangered	
Plantae	Flora	Persoonia laxa		Not Sensitive	Extinct	Extinct	
Plantae	Flora	Pimelea curviflora var. curviflora		Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Prasophyllum fuscum	Slaty Leek Orchid	Category 2	Critically Endangered	Vulnerable	
Plantae	Flora	Prostanthera marifolia	Seaforth Mintbush	Category 3	Critically Endangered	Critically Endangered	
Plantae	Flora	Rhodamnia rubescens	Scrub Turpentine	Not Sensitive	Critically Endangered	Critically Endangered	
Plantae	Flora	Sarcochilus hartmannii	Hartman's Sarcochilus	Category 2	Vulnerable	Vulnerable	
Plantae	Flora	Senecio spathulatus	Coast Groundsel	Not Sensitive	Endangered	Not Listed	
Plantae	Flora	Syzygium paniculatum	Magenta Lilly Pilly	Not Sensitive	Endangered	Vulnerable	
Plantae	Flora	Tetratheca glandulosa		Not Sensitive	Vulnerable	Not Listed	
Plantae	Flora	Tetratheca juncea	Black-eyed Susan	Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Thesium australe	Austral Toadflax	Not Sensitive	Vulnerable	Vulnerable	
Plantae	Flora	Triplarina imbricata	Creek Triplarina	Not Sensitive	Endangered	Endangered	

Source: NSW BioNet Species Sightings

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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 C

Historical Title Search Results

ABN: 36 092 724 251
Ph: 02 9099 7400
(Ph: 0412 199 304)

Level 14, 135 King Street, Sydney
Sydney 2000
GPO Box 4103 Sydney NSW 2001
DX 967 Sydney

Report

Re: - Hornby Lighthouse, Watsons Bay, NSW 2192

Description: - Lot 415 D.P. 752011

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
10th October 1877	Crown Reserve 26 for Defence Purposes and Lighthouses	Government Gazette 10th October 1877 Folio 3959
16th August 1934	Vested in the Commonwealth of Australia	Commonwealth Gazette 16th August 1934 Folios 1407 & 1408
18th February 1937	Commonwealth of Australia (For Defence Purposes)	Commonwealth Gazette 18th February 1937 Folio 309
1944	Crown Plan 6081-2030 stating Portion 415 to be retained by the	
3rd September 1976	Hornby Lighthouse (Geographical Names Act)	Government Gazette 3rd September 1976 Folio 4755
	# The State of New South Wales	415/752011

 # Denotes current registered proprietor

Easements: - NIL

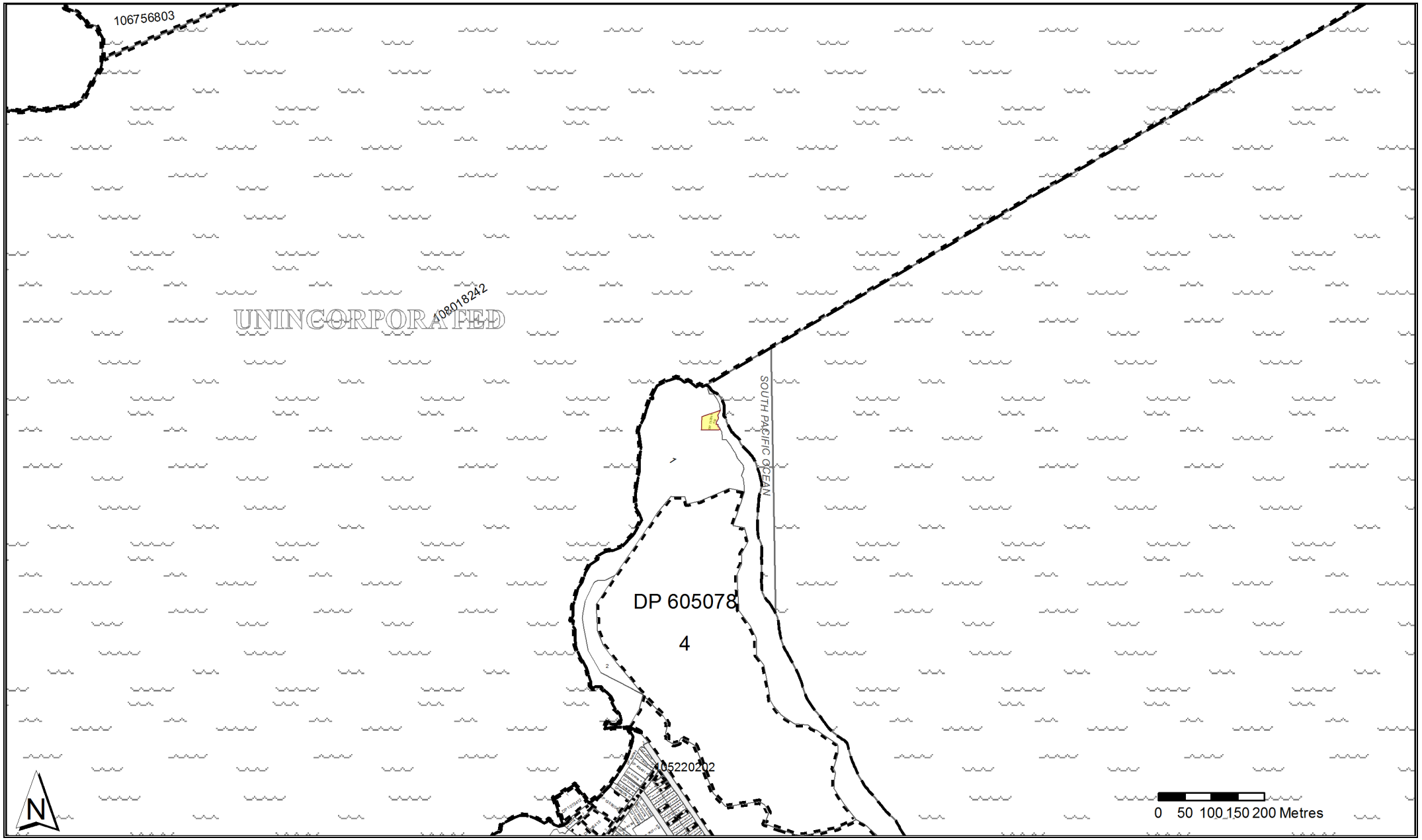
Leases: - NIL

Yours Sincerely
Mark Groll
10 September 2024

Cadastral Records Enquiry Report : Lot 415 DP 752011

Ref : LS061287_EP - Hornby Lighthouse

Locality : WATSONS BAY
Parish : ALEXANDRIA
LGA : WOOLLAHRA
County : CUMBERLAND



Report Generated 11:34:11 AM, 10 September, 2024
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This information is provided as a searching aid only.Whilst every endeavour is made to ensure that current map, plan and titling information is accurately reflected, the Registrar General cannot guarantee the information provided. For ALL ACTIVITY PRIOR TO SEPTEMBER 2002 you must refer to the RGs Charting and Reference Maps

Cancels plan C. 2329. 2030.

PLAN OF PORTIONS 415 & 721

Parish of Alexandria County of Cumberland

LAND DISTRICT OF METROPOLITAN LAND BOARD DISTRICT OF SYDNEY

MUNICIPALITY OF VAUCLUSE

Papers L.B. 40.589 P. 42. 3234.

Applied for under the Section of the Crown Lands Consolidation Act 1913 by

Within R. 26 from Sale for Defence Purposes and Lighthouses, Notified 10th October 1877.

Por 721. Proposed to be acquired by the Commonwealth of Australia.
" 415. " " " retained by the State of N.S.W.

Por 721 Acquired for Commonwealth Purposes. Comm. Gaz. 17. 5. 45

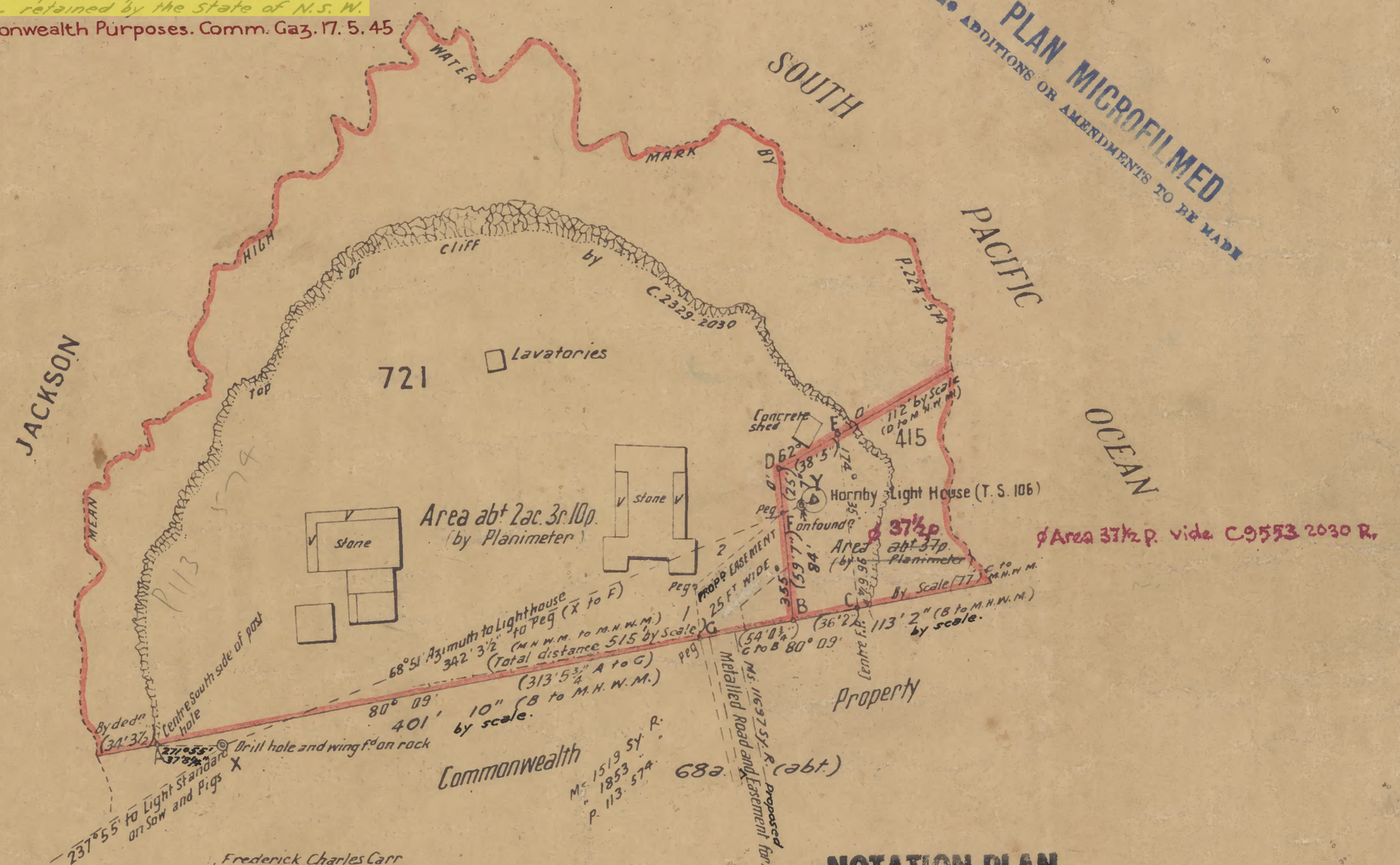
NOTATION PLAN

A 30:a

NOTES

This survey is confined to lines ABC, BDE, and the Easement within Portion 721.
M.H.W.M. is plotted from Plan P.224.574; and the top of Cliffs from Plan C.2329.2030.

PLAN MICROFILMED
NO ADDITIONS OR AMENDMENTS TO BE MADE



X.Y.
L.D.1278 S 17 to 32.

Reference to Corners

A	271°55'	on rock	37	8¾"
F	248°51'	on found	1	23"

Reference to Traverse

1	355°21'	29'4"	
2	52°0'	64'0"	

I, Frederick Charles Carr of Sydney a Surveyor registered under the Surveyors Act, 1929 do hereby solemnly and sincerely declare that the survey represented in this plan has been made by me in accordance with the Survey Practice Regulations 1933 and the special requirements of the Department of Lands was completed on the 26th July 1944, and the reference marks have been placed as shown hereon.

And I make this solemn declaration conscientiously believing the same to be true and by virtue of the provisions of the Oaths Act, 1900.

Fred. C. Carr
Surveyor registered under the Surveyors Act 1929

Subscribed and declared before me at Sydney this SIXTH day of September 1944

W. O. Scott J.P.
Justice of the Peace

Transmitted to the District Surveyor with my letter of 6.9.44 No 122.

Checked and Chained W.J. Christopherson. 16.1.45.

Examined and Plan approved

18th January 1945

I CERTIFY that this is a CORRECT COPY of the original plan of survey and of all notations thereon now relevant, I being the officer having the custody thereof.

Officer-in-Charge, General Drafting Branch 25 Jan 1945

6081-2030

Scale 1 Chain (66 feet) to an Inch

Cat. No C. 6081. 2030.

Req:R047981 /Doc:CP 06081-2030 P /Rev:01-Dec-2012 /NSW LRS /Prt:10-Sep-2024 11:14 /Seq:1 of 1
© Office of the Registrar-General /Src:InfoTrack /Ref:LS061287_EP - Hornby Lighthouse

Req:R048493 /Doc:CP 01853-3000 P /Rev:27-Oct-2014 /NSW LRS /Prt:10-Sep-2024 11:44 /Seq:1 of 1
© Office of the Registrar-General /Src:InfoTrack /Ref:LS061287_EP - Hornby Lighthouse

PLAN
of
RESERVE Nº 26 FROM SALE FOR DEFENCE PURPOSES AND LIGHT-HOUSES

Notified 10th October _ 1877

Parish of Alexandria _ County of Cumberland

Scale _ 6 chains to an inch.

Cancelled in part (area occupied by Hornby Lighthouse) by plan C2329-2030

68 acres included in list of Military Lands for transfer to the Commonwealth.

Pt. Res. 26 Abt 15½ ac South of Macquarie Lighthouse Site Revoked 6th December 1918.
Abt. 15½ ac (immediately S. of Macquarie Lighthouse Site) R53105 fr. Sale 53106 fr. L. genly for Public Recreation. Notfd 6th Dec. 1918.
1a 2r. 2½p. (Sth. Por. 1477) acquired for Defence purposes C'wealth. Gaz. 28 · 6 · 56 Ms 15964 Sy. R.
Abt 3a 2r. (Nth of Propd. Macquarie Lighthouse Site) R. 78967 fm. Sle (78968 fm. Lse genly) for Public Recreation Notfd 12·10·56

Vide Misc 06-3068 resumption for and subsequent removal of turf from the Reserve

JACKSON

South Reef
Vide plan C2329-2030
INNER SOUTH HEAD
Inner Light House (Hornsby)
P/113574
LADY BAY
Cancelled by C 9553 2030 R.
(about) 70 Acs 68 Acs
Military Wharf
CAMP COVE
WATSON'S BAY
MILITARY ROAD
BALUNE PARADE
ROAD
GAP BLUFF
THE GAP
GAP PARK
Proclaimed 28th June '87
9 1 4
JACOBS LADDER
SEE DIAGRAMS
Cancelled by C5629 2030
Cancelled by C5604 2030 5609
OUTER SOUTH HEAD
Vide Diagram "A"
CAMBRIDGE ST.
R75282.1603
(about) 30 Acs
Cancelled by C 7218-2030 R.
Site of Macquarie Light House 6ac 2r 22p. Ms 5056 Sy. To be transferred to the Commonwealth of Australia vide Misc 17-9259.
Cancelled by C 7535 2030 R.
1581 a r p 3 1 0
108 James Robert Harrison 4 2 15 C.604.630
B.P. O'Brien 1·3·27
Three parts R29 Not to be disturbed of present vide Ms 18 1395

PACIFIC OCEAN

SOUTH HEAD ROAD

Gun Site
Gunners Quarters
Transferred Property
Ms 5345 Sy.
Fowl House
Naval Hut
RED TINT
Signal Station
RED HATCHING
Fowl House

— DIAGRAM "A"
shewing areas to be regarded as — Transferred property.
— Scale one chain to an inch —
Red color & red hatching
Aln. 20-6396.

DIAGRAM
Scale 2 chains to an inch.

GAP PARK
Proclaimed 28th June '87
9 1 4
SOUTH HEAD ROAD
1 Ac. 0 R. 38 P. (about)
OCEAN
PACIFIC
Cut in rock
154
Dedicated for Defence Purps 29th March 1892
0 Ac. 3 R 11 P.
Signal Station
Holesac cut in rock

DIAGRAM
Scale 1 chain - 1 inch.

SOUTH HEAD ROAD
ROADWAY
½ Mile Stone
Cut in rock
154
Dedicated for Defence purposes 29th March 1892
0 Ac. 3 R. 11 P.
Signal Station
Pilot Signalling Staff
Nail at point of R-cut in fence post
SOUTH HEAD METALLED ROAD
Fence
Holesac cut in rock

NOTES.
Points denoted P are marked thus ⊠ Nail in P in top of angle iron post

NOTE. Bearings and lengths from a to b are obtained by calculation.

NOTE.—This plan has been prepared from information obtained from plans catalogued:—Ms 1519 Sy, V.I 2561 Shts 1 & 2, W.29.1925, Ms 534 Sy, Ms 1362 Sy, R3.784 Sht c., P.51A 574., Ms 1351 Sy, Ms 1727 Sy, C.521 630, C.604.630, Appn Plan 215 (Roll) L.T. Office, W.18.1939 Sht 3, Appn Plan 13188. L.T.O.

PLAN MICROFILMED
NO ADDITIONS OR AMENDMENTS TO BE MADE
1853-3000

(Ms 1853 Sy.)

Req:R048440 /Doc:CP 02329-2030 P /Rev:27-Nov-2012 /NSW LRS /Prt:10-Sep-2024 11:42 /Seq:1 of 1
© Office of the Registrar-General /Src:InfoTrack /Ref:LS061287_EP - Hornby Lighthouse

Land District *Metropolitan*
Land Board District *of Sydney*
Eastern Division

Papers L.B. 02

Cancels part of plan Ms 1853 SY

PLAN

of Portion 721

County of Cumberland *Parish of Alexandria*

To be vested in the Commonwealth under part 1 of Secn 85 of the Commonwealth of Australia Constitution Act 63 & 64 Vic. C. 12

Scale 1 Chains to an Inch

Authorized to be transferred to the Commonwealth by exchange Com. Gaz. 16.8.34.
Acquisition by agreement of land for defence purposes Com. Gaz. 18.2.37 (in lieu of not. 16.8.34.)
The area of 1a 3r 12p forms part of Reserve 26 from sale for Defence purposes and Light houses Notd 10th Oct 1877

P113574 roll

Inner South Head

C. 6081. 2030. R.

Jackson

Port

SOUTH PACIFIC OCEAN

precipitous rocks

edge of

721

1a . 3r . 12p

Hornby Light-house.
T.S. 106

Stone
wood
Stone
Shed
Stone

Ms 1518 SY
" 1853 "

Cancelled by

from T.S. 119

Part of Reserve 26 from Sale for Defence purposes and Lighthouses Notd 10th Octr 1877

Note. This plan does not purport to show the line of high water mark

Azimuth taken from T.S. 119.

Field Book Vol. 7948 Folio 19

CANCELLED PLAN
"To be used for Record Purposes only."

PLAN MICROFILMED
NO ADDITIONS OR AMENDMENTS TO BE MADE

Corners

Cor.	Bearing	From	Links	No on tree
A	Stake			↑ 721
B	Post			↑ 721

Traverse

Line	Bearing	Distance	Line	Bearing	Distance

I hereby certify that I in person made and completed the survey represented on this plan on the 16th October 1902 on which are written the bearings and lengths of the lines measured by me and I declare that the survey has been executed in accordance with the regulations published for the guidance of Licensed Surveyors and the practice of the Department of Lands.

G. H. Madew
Licensed Surveyor

Transmitted to the District Surveyor with my letter of 22nd October 1902 No 106

Voucher No staff Passed
Calculation Book No 1997 Folio 42
Checked and Charted Rolfe 18/11/02 1902
Examined E
Plan approved Edwin 29 Dec 02
Deputy Surveyor in Charge

2329-2030

N.S.W. Lith. Of. 392.0

Lithographed and Printed at the Department of Lands, Sydney, N.S.W. 1901

Cat No 2329-2030

SUPPLEMENT

TO THE

NEW SOUTH WALES

Government Gazette.

PUBLISHED BY AUTHORITY.

No. 323.] WEDNESDAY, 10 OCTOBER. [1877.

[3160] Department of Lands,
Sydney, 10th October, 1877.

RESERVE FROM SALE FOR DEFENCE PURPOSES AND LIGHT-HOUSES.

HIS Excellency the Governor, with the advice of the Executive Council, directs it to be notified that in pursuance of the provisions of the 4th section of the Crown Lands Alienation Act of 1861, the land specified in the Schedule appended hereto shall be reserved from sale for defence purposes and light-houses.

THOMAS GARRETT.

No. 26. County of Cumberland, parish of Alexandria, area about 105 acres. The Crown Lands within the following boundaries: Commencing at a point on the coast, at the north-east corner of J. R. Harrison's 4 acres 2 roods 15 perches; and bounded thence on the south by the north boundary of that portion and the north boundary of B. P. Griffin's 3 acres 3 roods 27 perches, bearing west to the South Head Road; thence by that road in a northerly direction to a lane 50 links wide forming the north-eastern boundary of the Church of England Church and School ground; thence by that lane north-westerly forming the easterly boundaries of the Public School, 1 acre 2 roods 13 perches, D. Egan's 2 roods and 6 perches, 1 acre and 33 perches, and 1 rood and 19 perches, and the northern boundary of W. Parker's 2 roods, and the north-eastern boundary of E. Laing's 20 acres, to the waters of Port Jackson; thence by those waters northerly to the sea; and by the sea southerly to the point of commencement.

[3159] Department of Lands,
Sydney, 10th October, 1877.

RESERVE FROM LEASE FOR PUBLIC PURPOSES.

IT is hereby notified, for general information, that His Excellency the Governor, with the advice of the Executive Council, has been pleased to withdraw for public purposes, the portion of land hereinafter described from the Ulambie, Euroka, Taloona, Kent, and Culmier Runs, of which it hitherto formed part.

THOMAS GARRETT.

LIVERPOOL PLAINS DISTRICT.

No. 136. Counties of Baradine and Leichhardt, area 670 acres, on the road from Walgett, on the Barwon, to Deerama, near Nugal, on the Castlereagh. The Crown Lands within 4 chains in rectangular distance on the eastern side of the line marked by Mr. Surveyor M'Master, in 1877, for the aforesaid road, and extending from the south boundary of the permanent common at Walgett, dedicated 12th March, 1869, southerly to the Castlereagh River, at Deerama, near Nugal, as shown on plan catalogued R. 1,383–1,603, sheets 1 and 2.

SYDNEY:

Printed and Published by CHARLES POTTER, Acting Government Printer, Phillip-street, 10th October, 1877.

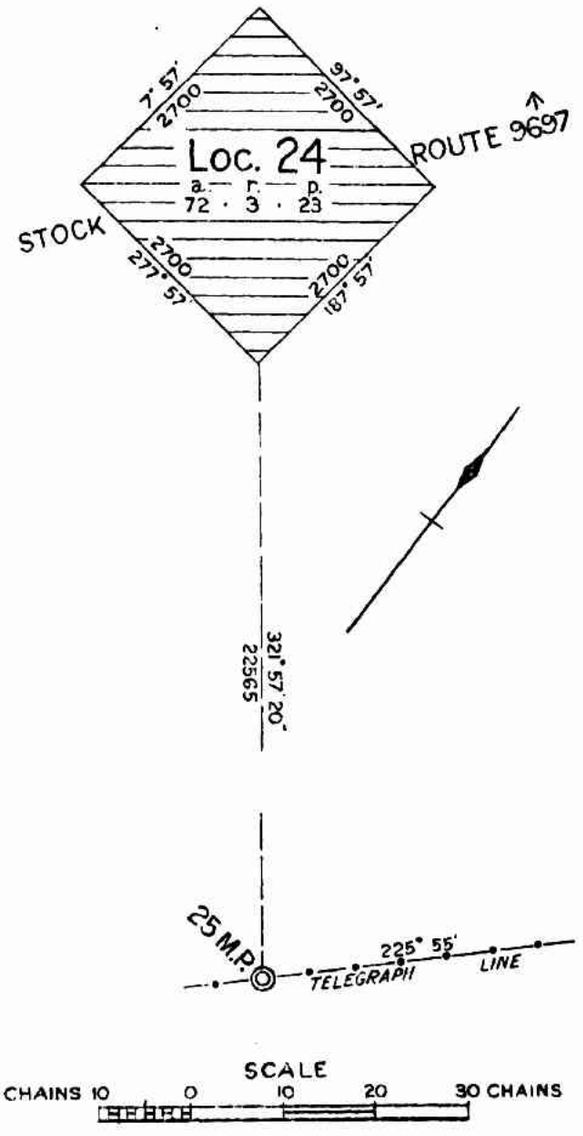
National Library of Australia http://nla.gov.au/nla.news-page13865460

DESCRIPTION OF LAND REFERRED TO.

All that piece of land containing an area of 72 acres 3 roods 23 perches more or less being Dampier location 24 in the State of Western Australia, as shown hachured on plan hereunder. Commencing at a point which bears 321 degrees 57 minutes 20 seconds 22565 links from the 25-mile post on the overland telegraph line and bounded thence by lines bearing—

277	degrees	57	minutes	2700	links
7	„	57	„	2700	„
97	„	57	„	2700	„
and 187	„	57	„	2700	„

to the point of commencement.



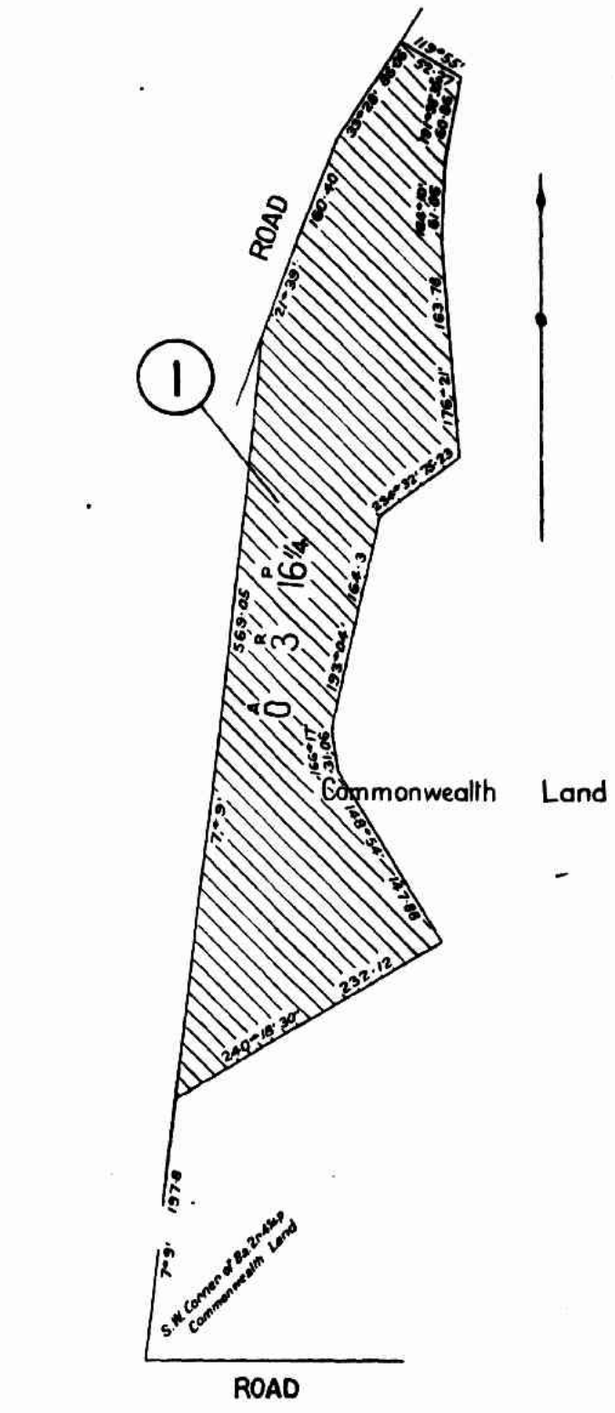
EXCHANGE OF CERTAIN LAND AT NEWCASTLE FOR CERTAIN OTHER LAND AT VAUCLUSE, NEW SOUTH WALES.

WHEREAS the land firstly described in the schedule hereunder is not required for any public purpose, His Excellency the Governor-General in Council has authorized, pursuant to section 63 of the *Lands Acquisition Act* 1906-1932, the disposal of such land by transfer to the Government of the State of New South Wales, the consideration for such transfer being the transfer by the Government of the State of New South Wales to the Commonwealth of the land secondly described in the said schedule.—(L.413; C.L.933.)

J. A. PERKINS
Minister of State for the Interior.

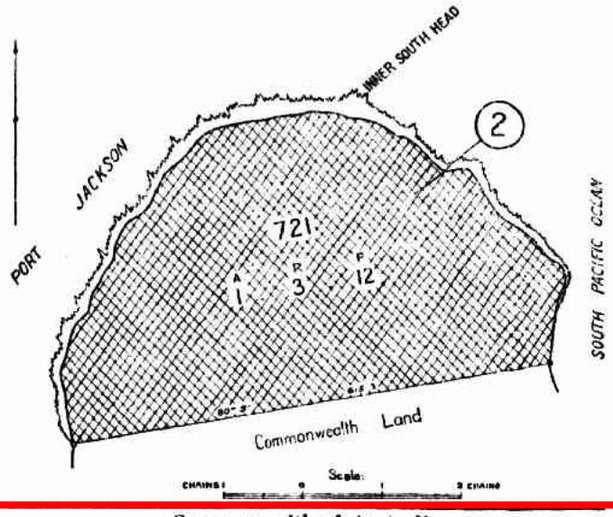
SCHEDULE.

Firstly, all that piece of land containing an area of 3 roods 16.25 perches more or less being part of the land shown on Plan Ms. 513 Md. recorded in the Department of Lands, Sydney, and situate in the City of Newcastle, Parish of Newcastle, County of Northumberland, State of New South Wales, as shown hachured on plan hereunder.



Secondly, all that piece of land containing an area of 1 acre 3 roods 12 perches more or less being portion 721, Parish of

Alexandria, County of Cumberland, State of New South Wales, as shown cross hachured on plan hereunder.



Commonwealth of Australia.

The *Lands Acquisition Act* 1906-1932.

NOTIFICATION OF THE ACQUISITION OF LAND BY THE COMMONWEALTH.

IT is hereby notified and declared by His Excellency the Governor-General, acting with the advice of the Federal Executive Council, that the land hereunder described has been acquired by the Commonwealth under the *Lands Acquisition Act* 1906-1932, for the following public purpose, namely, defence purposes at La Grange Bay, Western Australia.—(C.L.1326.)

Dated the first day of August, One thousand nine hundred and thirty-four.

ISAAC A. ISAACS
Governor-General.

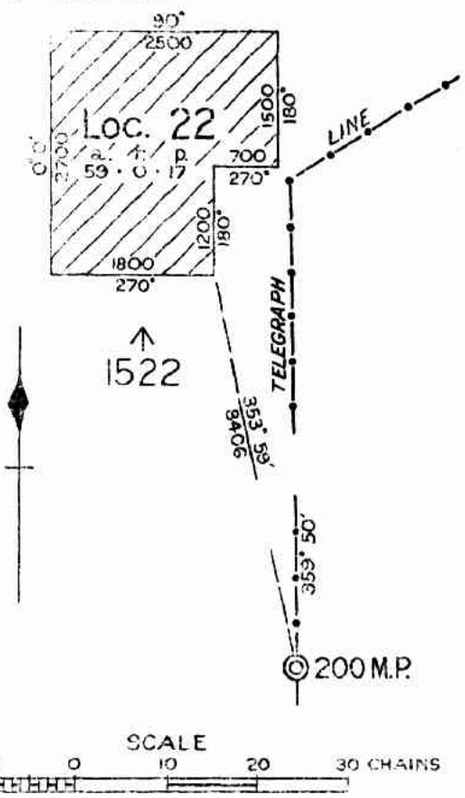
By His Excellency's Command,
J. A. PERKINS
Minister of State for the Interior.

DESCRIPTION OF LAND REFERRED TO.

All that piece of land containing an area of 59 acres 17 perches more or less being Dampier Location 22, in the State of Western Australia, as shown hachured on plan hereunder, commencing at a point which bears 353 degrees 59 minutes 8406 links from the 200-mile post on the overland telegraph line and bounded thence by lines bearing—

270	degrees	1800	links
360	„	2700	„
90	„	2500	„
180	„	1500	„
270	„	700	„
and 180	„	1200	„

to the point of commencement.



TENDERS.

DEPARTMENT OF THE INTERIOR—WORKS AND SERVICES BRANCH.

TENDERS INVITED.

Locality and Description of Work.	Tenders Returnable at—	Plans, Specifications, &c., Available at—	Tenders to be addressed to—
New Commonwealth Bank, Northam.—Electric light and power installation	Noon, 14th August, 1934	Works Director, G.P.O. Buildings, Perth, Western Australia	Works Director, G.P.O. Buildings, Perth, Western Australia
G.P.O., Brisbane.—Repairs and Improvements to Telegraph Counter, G.P.O., Brisbane	2 p.m., 22nd August, 1934	Works Director, Desmond-Chambers, Adelaide-street, Brisbane, Queensland	Works Director Adelaide-street, Brisbane, Queensland
Barmedman Post Office and Residence.—Repairs and painting	Noon, 27th August, 1934	Works Director, Customs House, Sydney: and at Post Offices, Temora and Barmedman, New South Wales	Works Director, Customs House, Sydney, New South Wales
North Carlton Drill Hall.—Erection of Gun Park and Harness Room (Brick)	11 a.m., 27th August, 1934	Works Director, 315 Post Office-place, Melbourne, Victoria	Works Director, 315 Post Office-place, Melbourne, Victoria
Queenscliff Fort.—Additions (brick) to Mess Building	„ „	Works Director, 315 Post Office-place, Melbourne: and at Post Office, Geelong, Victoria	„ „ „

TENDERS ACCEPTED.

Locality and Description of Work.	Amount.	Contractor and Address.	Date of Acceptance.	Date of Completion.
	£ s. d.			
Commonwealth Bank, Northam.—Erection of new Banking Premises and Manager's Residence	4,562 0 0	Todd Bros., Cleaver-street, West Perth, Western Australia	23.7.34	21.1.35
Acton (F.C.T.).—Erection of Shelter Shed at Recreation Reserve	210 0 0	Wm. McCullough, 76 Causeway, Canberra, Federal Capital Territory	13.8.34	17.9.34
Post Office, Laidley.—Erection of garage	72 12 6	G. A. Mercer, c/o Postmaster, Clifton, Queensland	29.6.34	19.7.34
Jandowae Post Office.—Repairs	82 0 0	G. A. Mercer, c/o Postmaster, Laidley, Queensland	19.7.34	29.8.34
Mona Vale Telephone Exchange.—Supply and delivery on site at Pittwater-street of Steel Windows	73 2 6	W. H. Piper, Ultimo, New South Wales	24.7.34	13.8.34
Central Concord Commonwealth Bank.—Erection and Completing of Banking Premises	3,888 0 0	Kell and Rigby, Sydney, New South Wales	27.7.34	7.2.35

National Library of Australia http://nla.gov.au/nla.news-page25050655

ACQUISITION BY AGREEMENT OF LAND FOR DEFENCE PURPOSES AT VAUCLUSE, NEW SOUTH WALES.

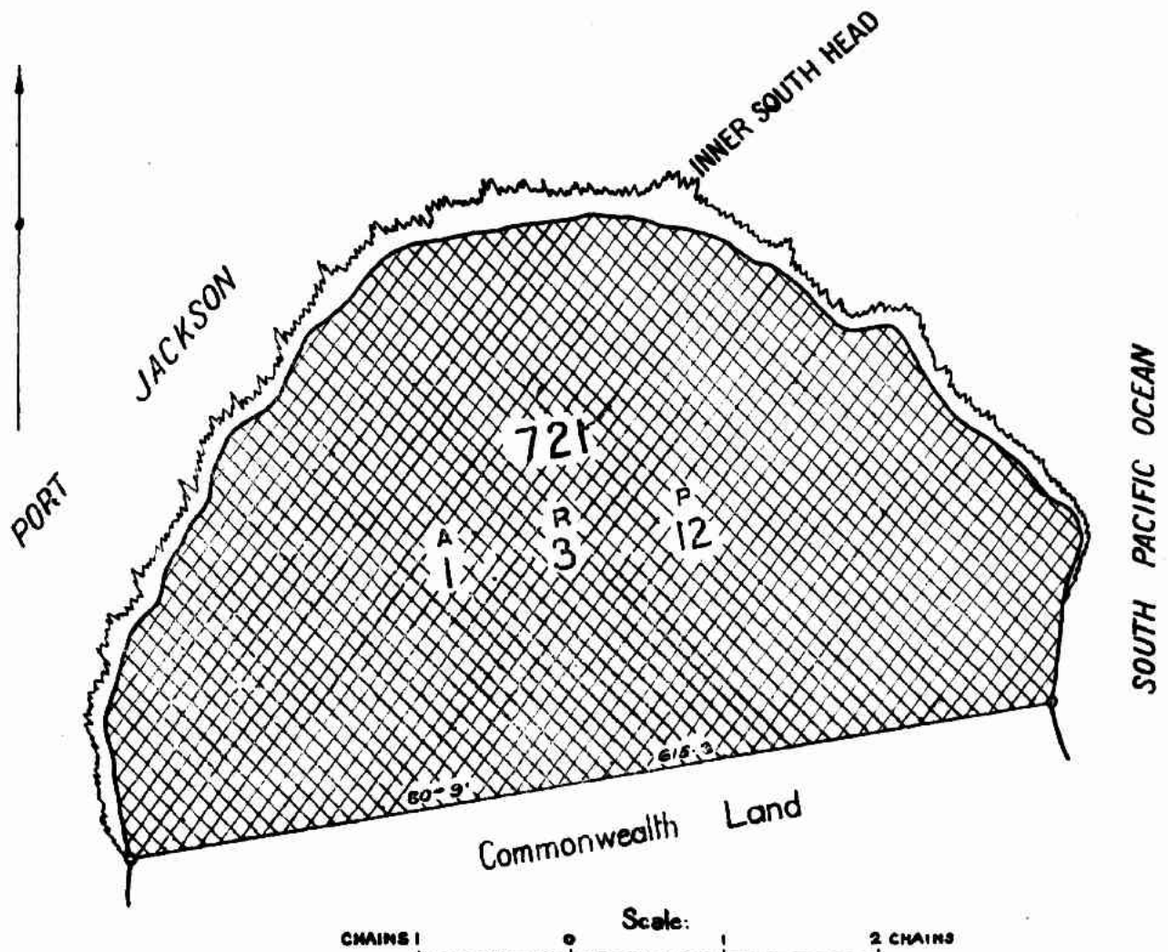
HIS Excellency the Governor-General in Council, pursuant to section 6 of the *Lands Acquisition Act* 1906-1936, has agreed with the Governor of the State of New South Wales for the purchase by the Commonwealth for Defence purposes of the State Crown lands described in the schedule hereunder.

(C.L. 933.)

T. PATERSON
Minister of State for the Interior.

SCHEDULE.

All that piece of land containing an area of 1 acre 3 roods 12 perches more or less being Portion 721, Parish of Alexandria, County of Cumberland, State of New South Wales, as shown cross-hachured on plan hereunder.



(This is in lieu of notification published in *Commonwealth of Australia Gazette*, No. 56, dated 16th August, 1934.)

TENDERS.

DEPARTMENT OF THE INTERIOR—WORKS AND SERVICES BRANCH.

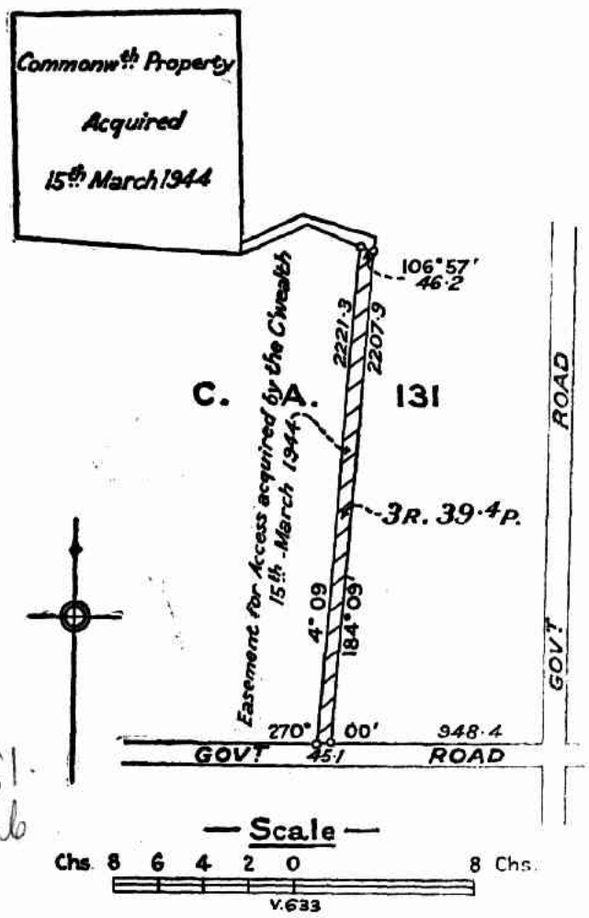
TENDERS INVITED.

Locality and Description of Work.	Tenders Returnable at—	Plans, Specifications, &c., Available at—	Tenders to be addressed to—
Prince of Wales Hospital, Randwick.—Repair roads and footpaths	Noon, 1st March, 1937	Works and Services Branch, Customs House, Sydney	Works Director, Customs House, Sydney
Royal Edward Victualling Yard, Pyrmont.—Alterations to electric lifts	" "	" " " "	" " "
Chippendale Postal Garage.—Installation of electric light and power	" "	" " " "	" " "
Randwick Military Depot.—Alterations, repairs and painting	" "	" " " "	" " "

National Library of Australia http://nla.gov.au/nla.news-page25045223

SCHEDULE.

All that piece of land containing an area of 3 roods 39.4 perches more or less being part of Crown Allotment 131 Parish of Sale County of Tanjil State of Victoria as shown hachured on plan hereunder: Commencing at a point which bears 270 degrees 948.4 links from the southeastern corner of Crown Allotment 131 Parish of Sale and bounded thence by part of the northern side of a government road bearing 270 degrees 45.1 links thence by lines bearing 4 degrees 9 minutes 2221.3 links 106 degrees 57 minutes 46.2 links and 184 degrees 9 minutes 2207.9 links to the point of commencement.



COMMONWEALTH OF AUSTRALIA.

The Lands Acquisition Act 1906-1936.

NOTIFICATION OF THE ACQUISITION OF LAND BY THE COMMONWEALTH.

IT is hereby notified and declared by His Royal Highness the Governor-General acting with the advice of the Federal Executive Council, that the land hereunder described has been acquired by the Commonwealth under the *Lands Acquisition Act* 1906-1936, for the following public purpose, namely: Purposes of the Commonwealth at Hornby Head, Watson's Bay, New South Wales.—(C.L.11924.)

Dated this eighth day of May, One thousand nine hundred and forty-five.

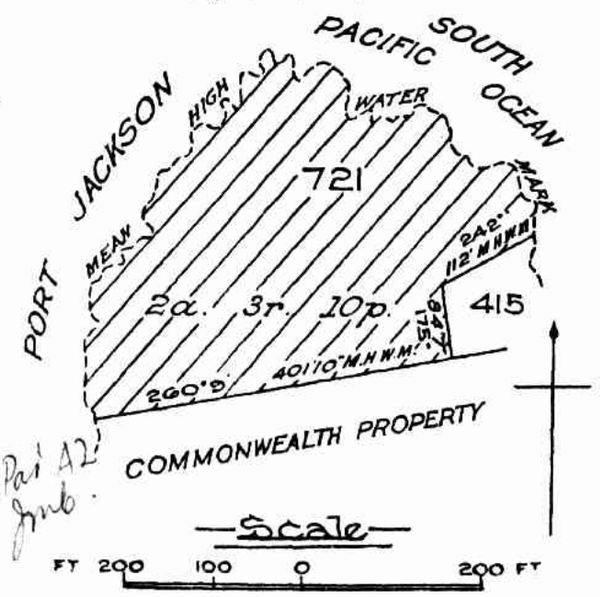
HENRY
Governor-General.

By His Royal Highness's Command,

J. S. COLLINGS
Minister of State for the Interior.

DESCRIPTION OF LAND REFERRED TO.

All that piece of land containing an area of 2 acres 3 roods 10 perches more or less being Portion 721 Parish of Alexandria County of Cumberland State of New South Wales as shown hachured on plan hereunder.



TENDERS.

POSTMASTER-GENERAL'S DEPARTMENT.

TENDERS ACCEPTED.

Contract No. 5814.—Telephone & Electrical Industries Pty. Ltd., Box 42, P.O., Redfern, New South Wales.—S.42/1878—Keys, switchboard, £429 9s. 6d. Victoria.

Contract No. 7071.—Standard Telephones & Cables Pty. Ltd., Box 525B, G.P.O., Sydney, New South Wales.—Schedule C.4264 Star quad carrier type cable, £26,378 0s. 11d. Queensland.

Contract No. 7155.—Standard Telephones & Cables Pty. Ltd., Box 525B, G.P.O., Sydney, New South Wales.—Schedule C.4198—Maintenance parts for A.P.O. standard uniselector, £4,672 10s. New South Wales and Victoria.

Contract No. 7422.—R. B. Shankly Pty. Ltd., 586 Bourke-street, Melbourne, Victoria.—Schedule C.4383—Printed matter, memo. and other books, £2,772 5s. 4d. New South Wales, Victoria, Queensland and South Australia.

Contract No. 7910.—Carr Fastener Co. of Aust. Ltd., Tapley's Hill-road, Royal Park, Adelaide, South Australia.—Schedule C.4487—Component parts for universal telephones, type 300, £291 13s. 4d. Victoria.

Contract No. 8188.—Bennett & Wood Pty. Ltd., Box 4255Y, G.P.O., Sydney, New South Wales.—Schedule C.4346—Bicycle parts, £408 15s. 7d. All States.

Contract No. 8250.—Siemens (Aust.) Pty. Ltd., Box 4328, G.P.O., Melbourne, Victoria.—Schedule C.3022—South Brisbane automatic exchange equipment, £4,266 12s. 8d., plus exchange. Queensland.

Contract No. 8251.—Siemens (Aust.) Pty. Ltd., Box 4328, G.P.O., Melbourne, Victoria.—Schedule C.3022—Toowong automatic exchange equipment, £4,266 12s. 8d., plus exchange. Queensland.

Contract No. 8282.—Punchbowl Brick & Pipe Co. Pty. Ltd., Box 19, P.O., Punchbowl, New South Wales.—Schedule C.4557—Conduits, earthenware and concrete, approximate quantities required during the period ending 31st December, 1945. New South Wales.

Contract No. 8283.—The New Brunswick Brick & Pottery Co. Pty. Ltd., 20 Queen-street, Melbourne, Victoria.—Schedule C.4557—Conduits, earthenware and concrete, approximate quantity required during period ending 31st December, 1945. Victoria.

Contract No. 8302.—Hodson & Gault Pty. Ltd., Springvale-road, Springvale, Victoria.—Schedule C.4562—Motor generators, £824. Western Australia.

Contract No. 8379.—Standard Telephones & Cables Pty. Ltd., Box 525B, G.P.O., Sydney, New South Wales.—Schedule C.4478—Murray transmitter parts, £245 16s. 9d. sterling. All States except Tasmania.

Contract No. 8395.—Standard Telephones & Cables Pty. Ltd., Box 525B, G.P.O., Sydney, New South Wales.—Schedule C.4464—Murray perforator parts, £1,022 3s. 5d. sterling. All States.

Contract No. 8418.—W. J. Clark, Esq., 83 Grenfell-street, Adelaide, South Australia.—Schedule C.4684—Printed forms, exchange maintenance "E.M." series, £338 16s. 11d. All States.

Contract No. 8424.—South East Manufacturing Co. Pty. Ltd., Cross Lane, Prahran, S.1, Victoria.—Schedule C.4346—Bicycle parts, (approximate), £919 9s. 7d. Victoria, Queensland, South Australia and Western Australia.

Contract No. 8432.—Telephone & Electrical Industries Pty. Ltd., Box 42 P.O., Redfern, New South Wales.—Schedule C.4559—Relay sets for 2,000 type automatic exchanges, £1,470. Victoria.

National Library of Australia http://nla.gov.au/nla.news-page25120291

(1810) Department of Lands, Sydney, 3rd September, 1976.

GEOGRAPHICAL NAMES ACT, 1966

HAVING reviewed place names on Central Mapping Authority 1:25,000 map of SYDNEY HEADS (within SYDNEY 9130 II-N, 1:100,000 map area), County of Cumberland, Land District Metropolitan, Shire Warringah, Municipalities Woollahra, Waverley, Mosman and Manly, in the area bounded by latitudes 33° 45′, 33° 52′ 30″, and longitudes 151° 20′, 151° 15′ the Geographical Names Board of New South Wales has this day discontinued certain recorded names and assigned geographical names as indicated hereunder.

SYDNEY HEADS MAP

Recorded Name Discontinued	*Designation*	*Geographical Name Assigned*	*Latitude*	*Longitude*	*Parish*
Cabbage Tree Beach	Beach	Manly Beach	33° 48′	151° 17′	Manly Cove
Koree and Chowder Bay	Bay	Chowder Bay	33° 50′ 30″	151° 15′	Willoughby
Chowder Head and Gwugal	Headland	Chowder Head	33° 50′ 30″	151° 15′	Willoughby
Curl Curl Creek	Creek	Manly Creek	33° 47′	151° 16′	Manly Cove
Curl Curl North Public School	School	North Curl Curl Public School.	33° 46′	151° 17′	Manly Cove
Hornby Light	Lighthouse	Hornby Lighthouse	33° 50′	151° 17′	Alexandria
Macquarie Light	Lighthouse	Macquarie Lighthouse.	33° 51′ 30″	151° 17′	Alexandria
Manly Boys High School	School	Balgowlah Boys High School.	33° 48′	151° 15′	Manly Cove
Manly District Park	Reserve	Manly Warringah District Park.	33° 47′	151° 16′	Manly Cove
Manly Vale High School	School	Mackellar Girls High School.	33° 47′	151° 16′	Manly Cove
Middle Harbour or Warring-ga	Harbour	Middle Harbour	33° 49′	151° 15′	Willoughby
North Point	Point	Blue Fish Point	33° 48′ 30″	151° 18′ 30″	Manly Cove
Parkhill Recreation Reserve	Reserve	Parkhill Reserve	33° 49′	151° 18′	Manly Cove
Point Piper and Willarra	Point	Point Piper	33° 52′	151° 15′	Alexandria
Shark Island and Bombilly	Island	Shark Island	33° 51′ 30″	151° 15′ 30″	Alexandria
Steel or Shark Point and Burroway	Point	Steel Point	33° 51′	151° 16′	Alexandria
Stoney Range Flora Reserve	Reserve	Stony Range Flora Reserve.	33° 45′	151° 16′ 30″	Manly Cove
Village of Manly	Suburb	Manly	33° 48′	151° 17′	Manly Cove
Wellings Recreation Reserve	Reserve	Wellings Reserve	33° 48′	151° 16′	Manly Cove
Wy-Ar-Gine Point	Point	Wyargine Point	33° 49′	151° 15′	Willoughby

Geographical Name Assigned	*Designation*	*Latitude*	*Longitude*	*Parish*
Arabanoo Lookout	Lookout	33° 48′ 30″	151° 16′	Manly Cove
Balgowlah Post Office	Post Office	33° 48′	151° 15′ 30″	Manly Cove
Balmoral Bay	Bay	33° 49′ 30″	151° 15′	Willoughby
Bareena Park	Reserve	33° 48′ 30″	151° 16′	Manly Cove
Beacon Hill	Hill	33° 45′ 30″	151° 16′	Manly Cove
Brookvale Post Office	Post Office	33° 46′	151° 16′	Manly Cove
Brookvale Technical College	College	33° 46′	151° 15′ 30″	Manly Cove
Bumbora	Reef	33° 49′	151° 16′ 30″	Manly Cove
Camp Cove Reserve	Reserve	33° 50′ 30″	151° 17′	Alexandria
Castle Rock Beach	Beach	33° 49′	151° 15′ 30″	Manly Cove
Castle Rock Reserve	Reserve	33° 49′	151° 15′ 30″	Manly Cove
Clifton Gardens Jetty	Jetty	33° 50′ 30″	151° 15′	Willoughby
Clontarf Beach	Beach	33° 48′ 30″	151° 15′	Manly Cove
Clontarf Reserve	Reserve	33° 48′ 30″	151° 15′	Manly Cove
Cobblers	Trig. Station	33° 49′ 30″	151° 16′	Willoughby
Cobblers Bay	Bay	33° 49′	151° 15′	Willoughby
Collins Beach	Beach	33° 48′ 30″	151° 17′	Manly Cove
Cowell	Trig. Station	33° 49′	151° 18′	Manly Cove
Dee Why Post Office	Post Office	33° 45′ 30″	151° 17′	Manly Cove
Dobroyd Hill	Hill	33° 48′	151° 16′	Manly Cove
Dobroyd	Trig. Station	33° 48′ 30″	151° 16′	Manly Cove
Dover Heights Boys High School	School	33° 52′ 30″	151° 17′	Alexandria
Fairlight	Suburb	33° 48′	151° 16′	Manly Cove
Fishermans Wharf	Wharf	33° 51′	151° 17′	Alexandria
Governor Phillip Lookout	Lookout	33° 45′ 30″	151° 16′	Manly Cove
Green Point	Trig. Station	33° 50′ 30″	151° 16′ 30″	Alexandria
Harbord Post Office	Post Office	33° 47′	151° 17′	Manly Cove
Hermitage Reserve	Reserve	33° 51′ 30″	151° 16′	Alexandria
John Fisher Park	Reserve	33° 46′	151° 17′	Manly Cove
Little Manly Beach	Beach	33° 48′ 30″	151° 17′	Manly Cove
Macquarie Lighthouse	Trig. Station	33° 51′ 30″	151° 17′	Alexandria
Manly Dam	Dam	33° 47′	151° 45′	Manly Cove
Manly Oval	Reserve	33° 48′	151° 17′	Manly Cove
Manly Post Office	Post Office	33° 48′	151° 17′	Manly Cove
Manly Rock	Rock	33° 47′ 30″	151° 17′ 30″	Manly Cove
Middle Head Oval	Reserve	33° 49′ 30″	151° 16′	Willoughby
Nielson Park Wharf	Wharf	33° 51′	151° 16′	Alexandria
North Curl Curl Beach	Beach	33° 46′	151° 18′	Manly Cove
North Harbour Reserve	Reserve	33° 48′	151° 16′	Manly Cove
Palm Avenue Public School	School	33° 47′	151° 16′ 30″	Manly Cove
Point Seymour	Point	33° 51′	151° 16′ 30″	Alexandria
Quarantine	Trig. Station	33° 49′	151° 18′	Manly Cove
Queenscliff Bay	Bay	33° 47′	151° 17′ 30″	Manly Cove
Rose Bay Park	Reserve	33° 52′ 30″	151° 15′	Alexandria
Rose Bay Post Office	Post Office	33° 52′ 30″	151° 16′	Alexandria
Royal Far West Childrens Hospital School.	School	33° 48′	151° 17′	Manly Cove
Shark	Trig. Station	33° 51′ 30″	151° 15′ 30″	Alexandria
Sow and Pigs	Trig. Station	33° 50′ 30″	151° 16′	Alexandria, Willoughby.
Sow and Pigs Reef	Reef	33° 50′ 30″	151° 16′	Alexandria
Sydney Harbour	Harbour	33° 51′	151° 15′	Willoughby, etc
The Sound	Strait	33° 49′	151° 16′	Manly Cove, Willoughby.

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NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
10/9/2024 11:14AM

FOLIO: 415/752011

First Title(s): THIS FOLIO
Prior Title(s): CROWN LAND

Recorded	Number	Type of Instrument	C.T. Issue
8/8/2003	9862506	DEPARTMENTAL DEALING	LOT RECORDED FOLIO NOT CREATED
23/1/2009	CA138691	CONVERSION ACTION	FOLIO CREATED CT NOT ISSUED

*** END OF SEARCH ***

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Received: 10/09/2024 11:14:59

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 415/752011

SEARCH DATE	TIME	EDITION NO	DATE
10/9/2024	11:14 AM	-	-

LAND

LOT 415 IN DEPOSITED PLAN 752011
AT WATSONS BAY
LOCAL GOVERNMENT AREA WOOLLAHRA
PARISH OF ALEXANDRIA COUNTY OF CUMBERLAND
(FORMERLY KNOWN AS PORTION 415)
TITLE DIAGRAM CROWN PLAN 6081.2030

FIRST SCHEDULE

THE STATE OF NEW SOUTH WALES (CA138691)

SECOND SCHEDULE (2 NOTIFICATIONS)

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* 1 THE LAND IS A RESERVE WITHIN THE MEANING OF PART 5 OF THE CROWN LANDS ACT 1989 AND THERE ARE RESTRICTIONS ON TRANSFER AND OTHER DEALINGS IN THE LAND UNDER THAT ACT, WHICH MAY REQUIRE CONSENT OF THE MINISTER.
* 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

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APPENDIX D

Data Quality Objectives

INTRODUCTION

The Data Quality Objectives (DQOs) process was used to define the type, quantity and quality of the data needed to support decisions relating to the environmental condition of a site (reference 1). The process consists of seven steps, with the output from each step influencing the choices that will be made later in the process.

According to USEPA (reference 2), DQOs are qualitative and quantitative statements, derived from the first six steps of the process, that:

- ◊ Clarify the study objective,
- ◊ Define the most appropriate type of data to collect,
- ◊ Determine the most appropriate conditions from which to collect the data, and
- ◊ Specify tolerable limits on decision errors which will be used as the basis for establishing the quantity and quality of data needed to support the decision.

The DQOs are then used to develop a scientific and resource-effective data collection design.

STEP 1 - STATE THE PROBLEM

Past activities at the site and surrounding land have the potential to have adversely affected the quality of soil across the site. In this regard soil quality data is required to assess the suitability of the site for the proposed development (medium density residential). The soil data will also assist in assessing potential vapour impacts from volatile contaminants of concern.

STEP 2 - IDENTIFY THE DECISION STATEMENT

The following decision were required to be made:

- ◊ Is there sufficient information on the distribution and characteristics of soil to properly characterise soil and groundwater at the site?
- ◊ Does the dataset adequately characterise the site for the purpose of assessing the suitability of the site for the proposed land uses and (if required) remedial options?

- ◊ Is the dataset sufficient to enable the preparation of defensible RAP for the site (if required)?
- ◊ Have potential off-site sources of potential contamination been investigated sufficiently?
- ◊ Do the concentrations of potential contaminants in the fill and/or natural soil exceed acceptable levels for the existing land-use?
- ◊ Are there any aesthetic issues relating to the fill and natural soils at the site?
- ◊ Is the data reliable?

STEP 3 - IDENTIFY INPUTS TO THE DECISION

The following information inputs are required to resolve the decision statement:

- ◊ Proposed land use,
- ◊ Detailed site inspection for sources of potential contamination,
- ◊ A review of the environmental and physical setting in which the site lies, including geology, hydrogeology, and topography,
- ◊ Review of the history of the site and surrounding land to research potential contaminating activities on the site or on nearby sites,
- ◊ The performance of shallow testpits in a systematic pattern across the site (subject to access constraints) while also targeting any areas of concern,
- ◊ Collection of environmental soil samples using appropriate methods,
- ◊ Analysis of selective soil samples for the contaminants of concern identified by the history search and site inspection,
- ◊ Analysis of any surface or buried fibro samples (if present) to confirm the presence of asbestos fibres,
- ◊ Comparison of the results with appropriate Site Assessment Criteria (SAC) as defined in the main body of the report, and
- ◊ Accurate measurements of sample locations to allow for accurate mapping and contouring of contamination (if identified).

STEP 4 - DEFINE THE BOUNDARIES OF THE STUDY

The site covers an area of approximately 700m^2 and is part of Part of Lot 415 in Deposited Plan (DP) 752011 and Part of Lot 1 in DP605078.

The site boundaries are shown on Figure 2 in the main body of the report.

The vertical extent of the study is defined as follows:

◊ Soil/fill characterisation: Base of fill (if present) and one (1) m into natural material (or refusal on bedrock),

The temporal boundary of the assessment is defined as the time between commencement and final sample collection.

STEP 5 - DEVELOP A DECISION RULE

The decision rules for this investigation are as follows:

◊ If it is determined that the data generated through this investigation are reliable and adequately characterise soil conditions at the site, the data will be compared against the adopted Site Assessment Criteria (SAC),

◊ If all the data meets the adopted SAC, then the site will be considered suitable for the proposed development,

◊ If the data do not meet the adopted SAC, then further investigations or the development of an RAP will be recommended as a basis for making the site suitable for the proposed development. Further investigations may include:

- Additional soil, vapour or groundwater sampling points to delineate impacts;
- Analysis of soil, vapour and/or groundwater for additional analytes/CoPC;
- Undertaking soil vapour investigations; and/or
- Undertaking a human health and/or ecological risk assessment to assess site suitability and, if not suitable, assess the requirement for remediation and/or management.

If it is determined that the data generated through this investigation are not reliable and/or do not suitably characterise the site, then further investigations may be recommended prior to comparison against the SAC.

STEP 6 - SPECIFY ACCEPTABLE LIMITS ON DECISION ERRORS

Acceptable limits on decision errors must be applied based on the Data Quality Indicators (DQIs) pertaining to precision, accuracy, representativeness, comparability and completeness. The limits on decision errors for the study are as follows:

1. Incorrectly deciding that levels are below an assessment criterion (Type I error). The consequence of this error is that there may be a conclusion that material conforms to a lower waste classification than is actually the case. A Type I error rate of 5% is nominated for the study;
2. In applying statistical analysis of a data set (where applicable/sufficient data set exists):
   - Exclude any individual sample with a concentration that exceeds 250% of SAC. This data point is to be regarded as an 'outlier';
   - Tests that assume a normal distribution will only be used if the coefficient of variance is less than 1.2;
   - The standard deviation of a sample population will not exceed 50% of the Alignment assessment criteria.
3. A robust quality assurance and quality control (QA/QC) program will be implemented with appropriate sampling and analytical density to satisfy the objective of the study.

Decision errors may result in:

1. Basing decisions on unreliable data and consequently making incorrect decisions regarding land use suitability;
2. Basing decisions on unreliable data and inappropriately defining a remedial or management strategy.

The Data Quality Indicators (DQIs) are described in Appendix G, while the adopted SAC are described in Section 8 of the main report.

STEP 7 - OPTIMISING THE DESIGN FOR OBTAINING DATA

The purpose of this step is to identify a resource-effective data collection design for generating data that are expected to satisfy the DQOs. To ensure that the design satisfies the DQOs, a comprehensive Quality Assurance and Quality Control (QA/QC) plan will be implemented as described in Section 7 and Appendix D of the main report.

References

1. NSW EPA, 2017: New South Wales Environment Protection Authority (2017): Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition).
2. USEPA, 2000: *Guidance for Data Quality Objectives Process*. EPA QA/G-4.

APPENDIX E

Quality Assurance Assessment Report

E1. INTRODUCTION

A detailed Quality Assurance (QA) assessment, including the analysis of Quality Control (QC) samples, was carried out by GEE to determine the reliability of field procedures and analytical results.

E2. QUALITY ASSURANCE

Quality Assurance (QA) involves all of the actions, procedures, checks and decisions undertaken to ensure the representativeness and integrity of samples and accuracy and reliability of analysis results (reference 1).

In accordance with AS4482.1 (reference 2), a series of QA procedures were integrated within the sampling and analysis plan and included:

- ◊ The collection of Quality Control (QC) samples.
- ◊ The use of standardised field sampling forms developed by GEE.
- ◊ Documentation of calibration and use of field instruments.

To ensure QA in the field, samples were collected by experienced and trained personnel using appropriate methods detailed herein, including appropriate sample handling, containment and transport, and calibrated equipment. Additionally, QC samples were collected and analysed as discussed in Section E3.

To ensure QA in the laboratory, GEE used laboratories that are NATA accredited for the analytical tests carried out, therefore it is reasonable for GEE to rely on the laboratories to be proficient in all tests conducted. This encompasses all actions, procedures, checks and decisions undertaken, to ensure the accuracy and reliability of the analysis results. As part of the laboratory QA, QC samples were analysed with each batch of samples as part of this investigation as required by NATA. A discussion of the laboratory QC samples analysed as part of this investigation is provided in Section E3.3.2.

E3. QUALITY CONTROL

QC involves those parts of QA which serve to monitor and measure the effectiveness of QA procedures. QC samples assess sample integrity, accuracy and precision and can be separated into field and laboratory QC.

E3.1 DEFINITIONS

Table E1 provides a description and objective of each of the field and laboratory QC samples used during this investigation.

Table E1: QC Sample Types, Descriptions and Recommended Frequency of Analysis

Type	Description	Purpose	Recommended Frequency
	FIELD QC SAMPLES		
Blind Replicate	A sample collected at the same time and from the same sampling point as the corresponding primary sample[1], and analysed at the same laboratory. Blind replicates are collected, preserved, stored, transported and analysed in the same manner as the primary sample, with the laboratory having no knowledge of the source of the replicate sample. The assessment of blind replicates samples is undertaken by calculating the Relative Percent Difference (RPD) which is defined as: $RPD\ (\%) = 100 \times \frac{\text{Result No. 1} - \text{Result No. 2}}{\text{Mean Result}}$	Used to evaluate total sampling and analysis precision and, in the case of soil samples, sample variability.	In accordance with AS4482.1 (reference 2) and NEPM (reference 3) it is recommended that 1 blind replicate sample is collected for every 20 primary samples.
Trip Blank	Trip blanks are laboratory supplied test samples of analyte-free media (either washed sand or de-ionised water) which remain in the sample storage eskies during sampling activities and returned to the laboratory unopened. For soil sampling programmes, the trip blank consists of acid-washed quartz sand that has been heated to 400ºC. For water sampling programs trip blanks comprise pre-washed glass vials containing distilled or de-ionised water with appropriate preservatives. The USEPA has shown that cross-contamination only occurs with volatile organics (reference 4), therefore, trip blanks are only analysed for volatile organics.	Used to measure cross-contamination during sampling, transport, sample preparation and analysis.	Industry standard is 1 trip blank per batch of primary samples.
Trip Spike	Trip spikes, like trip blanks, are supplied by the primary laboratory using analyte-free media (either washed sand or de-ionised water) and remain in the sample storage eskies during sampling activities and returned to the laboratory unopened. The sample media, however, is spiked with BTEX. For water sampling programmes the BTEX concentration is known and standardised by each laboratory, while for soil sampling programmes the exact spike concentration is not known, rather two identical jars of sand are spiked the same concentration with one sample becoming the trip-spike and the other becoming a control sample, which remains in a refrigerator at the laboratory. The trip spike is analysed after returning from the field and the % recovery of the known spike (for water sampling programs), or of the control sample (for soil sampling programs), is calculated.	Used to monitor VOC losses during transit.	Industry standard is 1 trip spike per batch of primary samples where volatile concentrations are being measured.

[1] Primary samples are the original representative samples of soil or groundwater collected for analysis to determine aspects of their chemical composition. Primary samples are the original sample taken from a particular location and other samples from the same location are duplicates, replicates or splits.

Table E1 Continued

Type	Description	Purpose	Recommended Frequency
Rinsate	This is a sample of distilled or de-ionised water poured over the surface of a decontaminated piece of sampling equipment and collected in appropriate laboratory supplied sample containers. The sample is then analysed for contaminants of concern analysed as part of the investigation.	Provides an assessment of potential cross contamination of chemicals from sampling equipment caused by inadequate decontamination procedures.	In accordance with AS4482.1 – (reference 2) one rinsate sample should be collected each day per piece of sampling equipment and.

Table E1 Continued

Type	Description	Purpose	Recommended Frequency
	LABORATORY QC SAMPLES		
Laboratory Duplicate	Laboratory duplicates are field samples which are prepared and analysed in the same manner twice. The assessment of laboratory duplicates is undertaken by calculating the (RPD) which is defined as: RPD (%) = 100 x (Result No. 1 – Result No. 2) / Mean Result	Determines analytical precision for a sample batch	NATA specifies 1 per 10 samples for trace element and inorganic analysis
Laboratory Control Sample (LCS)	Laboratory Control Samples (LCS) are analyte-free matrices (de-ionised water or clean sand) spiked with a known concentration of target analytes and carried through the entire preparation and analysis. Assessment of LCS is undertaken by calculating the percent recovery (%R) of the spike which is defined as: Percent Recovery (%R) = 100 x (Spikes Sample Result (SSR) – Sample Result (SR)) / Concentration of Spike Added (SA)	Determines analytical accuracy and precision for a batch of samples	NATA specifies 1 per batch of up to 20 samples
Surrogates	Surrogates are organic compounds added to field samples and laboratory QC samples prior to preparation. They are similar in chemical behaviour to the target analytes and are not expected to be present in samples. form part of the laboratory QC for organic analyses and are used to indicate the presence of sample specific interferences. The surrogate is added at the extraction stage then analysed with the batch of samples. Like LCSs, surrogates are assessed by calculating the percent recovery (%R), although the definition is slightly different as shown below: Percent Recovery (%R) = 100 x (Spiked Sample Result (SSR)) / Concentration of Spike Added (SA)	Used to demonstrate that the surrogate does not interfere with the target analytes, therefore determines analytical accuracy for each sample	Added to every blank, field and laboratory QC sample
Matrix Spikes	Field samples spiked with a known concentration of a target analytes and carried through the entire preparation and analysis. Matrix spike samples are assessed by calculating the percent recovery (%R) of the spike which is defined as: Percent Recovery (%R) = 100 x (Spikes Sample Result (SSR) – Sample Result (SR)) / Concentration of Spike Added (SA)	Determine the effects of matrix interferences on analytical accuracy of a sample.	Performed at least 1 per batch of up to 20 samples.
Method Blank	Method blanks are an analyte-free matrices (reagent water or clean sand) that is carried through the entire preparation and analysis.	Establishes that laboratory contamination does not cause false positives.	Prepared with every batch of up to 20 samples for all organic and inorganic analyses.

E3.2 CRITERIA / ACCEPTABLE RANGE

The QC Acceptance Criteria adopted for this investigation is provided in Table E2 and is in general accordance with the Table 4 of AS4482.1 (reference E2) and NEPM (reference E3).

Table E2: QC Sample Acceptance Criteria

QC Sample	Criteria / Acceptable Range
FIELD QC SAMPLES	
Blind Replicate	RPD < 50 % When average concentration is > 10 x LOR/PQL[2] RPD < 75 % When average concentration is 5 to 10 x LOR/PQL RPD < 150 % When average concentration is < 5 x LOR/PQL
Trip Blank	Analytical Result < LOR/PQL
Trip Spike	± 30%
Rinsate	Analytical Result < LOR/PQL
LABORATORY QC SAMPLES	
Laboratory Duplicates	RPD < 30 % When average concentration is > 10 x LOR/PQL RPD < 50 % When average concentration is 4 to 10 x LOR/PQL RPD < 100 % When average concentration is< 4 x LOR/PQL
Laboratory Control Samples	%R of 70 – 130% (General analytes) %R of 50 – 130% (Phenols) %R of 60 – 130% (OCP/OPPs) %R of 62 – 130% (Chromium)
Surrogates	%R of 70 – 130% (General analytes) %R of 50 – 130% (Phenols) %R of 60 – 130% (OCP/OPPs)
Matrix Spikes	%R of 70 – 130% (General analytes) %R of 50 – 130% (Phenols) %R of 60 – 130% (OCP/OPPs) %R of 62 – 130% (Chromium)
Method Blanks	Analytical Results < LOR/PQL

If data do not meet the QC Acceptance Criteria, then a judgement is made as to whether the exceedance is critical in relation to the suitability of the data set. Otherwise, the following steps will be taken:

- ◊ Request that the laboratory re-check or even re-analyse the sample.
- ◊ Inspect the sample for anomalies which may be causing the failure.
- ◊ If necessary, undertake additional sampling and analyses.

[2] Both the LOR and PQL are interchangeable terms used by laboratories and is defined as the lowest concentration that can be reliably achieved within specific limits of precision and accuracy during routine laboratory operating conditions (reference 5).

E3.3 RESULTS

E3.3.1 Field QC Samples

Field QC samples collected and analysed as part of this investigation comprised:

Soil Sampling

- ◊ One blind replicate (SG260924-100)
- ◊ One split duplicate (SG260924-101)
- ◊ One trip blank per batch of samples (labelled 'Trip Blank')
- ◊ One trip spike per batch of samples (labelled 'Trip Spike')
- ◊ One rinsate sample from sampling equipment (SG260924-R)

Tabulated results are presented at the conclusion of this Appendix. Table E3 and E4 provides a summary of the frequency of QC samples and lists results which do not meet the criteria established in Table E2.

Table E3: QC Sample Acceptance Criteria - Soil

Type	Frequency Conducted	Results Not Meeting the Criteria
Blind Replicate	Metals - 1 per 21 samples (4.7%)	--
	TRH/BTEXN - 1 per 9 samples (11.1%)	--
	PAH - 1 per 14 samples (7.1%)	PAH Compounds (RPDs 85 – 170%)
	OCPs - 1 per 17 samples (5.9%)	--
	PCBs – 1 per 9 samples (11.1%)	--
Split Duplicate	Metals - 1 per 21 samples (4.7%)	Copper, Lead and Zinc (RPDs 71 – 102%)
	TRH/BTEXN - 1 per 9 samples (11.1%)	--
	PAH - 1 per 14 samples (7.1%)	PAH Compounds (RPDs 76 – 122%)
	OCPs - 1 per 17 samples (5.9%)	--
	PCBs – 1 per 9 samples (11.1%)	--
Rinsate	Hand Auger	--
Trip Blank	1 per sample batch	--
Trip Spike	1 per sample batch	--

The soil program quality control results all conformed to the sample acceptance criteria except for some elevated RPDs for some metals and PAHs in the blind replicate and the split duplicate samples. The elevated RPDs is attributed to the heterogeneous nature of the samples rather than an error with the lab's precision.

Regardless, GEE has adopted to highest concentrations when assessing contamination risk and when making conclusions about the site.

E3.3.2 Laboratory QC

Laboratory QC results are provided in the laboratory reports while a summary of the results which exceeded the acceptance criteria is provided in Table E4.

Table E4: QC Sample Acceptance Criteria

Type	Results Exceeding Criteria
Laboratory Duplicates	--
Laboratory Control Samples	--
Surrogates	--
Matrix Spikes	--
Method Blanks	--

E4. DATA QUALITY ASSESSMENT

In accordance with reference 1, Data Quality Indicators (DQIs), specifically, precision, accuracy, representativeness, completeness and comparability, were used to assess the reliability of field procedures and analytical results.

E4.1 PRECISION

This is the measure of the variability (or reproducibility) of the data. In the field precision is achieved by using standard operating procedures which were adopted by GEE during this investigation. For laboratory analysis precision is assessed using blind replicates and trip spikes. The measured RPDs for the blind replicate samples and split samples were considered acceptable as were the analytical results for the trip spike.

E4.2 ACCURACY

Accuracy is a measure of the closeness of a measurement to the true parameter value. In the field, accuracy is achieved by using standard operating procedures which were adopted by GEE. For laboratory analysis, accuracy is assessed using tip blanks, rinsate blanks, method blanks, matrix spikes, surrogates and laboratory control samples. Considering that these QC samples were of an acceptable standard, GEE considers the laboratory data set to be accurate.

E4.3 REPRESENTATIVENESS

This is the confidence (expressed qualitatively) that the data are representative of each media present on the site. This is achieved in the field and laboratory by using an adequate number of sampling points to characterise the site and ensuring that the samples collected were representative of the media from which they were collected. Additionally, samples should be analysed within necessary holding times depending on the analyte.

Environmental samples were collected from each borehole in general accordance with techniques described in Australian Standards AS4482.1 (reference 2) AS4482.2 (reference 6) and NEPM (reference 1), to maintain the representativeness and integrity of the samples. The number of sampling points did not meet the minimum required sampling density as defined by NSW EPA (reference 7), however, were considered sufficient for the purpose of this investigation.

Finally, all samples were analysed within holding times.

E4.4 COMPLETENESS

This is a measure of whether all the data necessary to meet the project objectives, were collected. In the field and laboratory, this is achieved by sampling all critical locations and depths using acceptable methods and ensuring samples are analysed for appropriate chemicals.

GEE selected a sufficient number of sample points for the purpose of the investigation as defined by the NSW EPA (reference 7). Additionally, samples were analysed for chemicals of concern based on appropriate field screening measures and logging of unusual aesthetics which may indicate contamination. Combined with the fact that standard operating procedures were adopted by GEE, the investigation is assessed as being complete.

E4.5 COMPARABILITY

This is a measure of confidence that data may be considered to be equivalent for each sampling and analysis event. Soil samples were collected by experienced GEE personnel using standard operating procedures and analysed in accordance with NATA accredited laboratory methods. The comparability of the data should be consistent as sampling protocols were employed throughout the duration of the fieldwork and analysis was undertaken by NATA registered laboratories using accredited analytical methods.

E5. CONCLUSION

A review of the DQIs indicates that the field procedures and analytical results adopted for this investigation are able to be relied upon for making conclusions and recommendations regarding the contamination status of the site.

References

1. *NEPC, 2013: National Environment Protection Council (1999). National Environment Protection (Assessment of Site Contamination) Measure, 1999. Schedule B(2) Site Characterisation.*

2. *Australian Standard AS4482.1 – 2005: Guide to the sampling and investigation of potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds.*

3. *NEPC, 1999: National Environment Protection Council (1999). National Environment Protection (Assessment of Site Contamination) Measure. Schedule B(3) Guideline of Laboratory Analysis of Potentially contaminated Soils.*

4. *Keith, 1991: Environmental sampling and Analysis, A practical guide. Lewis Publishers.*

5. *Popek (2003). Sampling and Analysis of Environmental Chemical Pollutants. Academic Press.*

6. *Australian Standard AS4482.2 – 1999: Guide to the sampling and investigation of potentially contaminated soil Part 2: Volatile substances.*

7. *NSW EPA, 2022: Environment Protection Authority NSW, 2022: Contaminated Land Guidelines: Sampling Design – Part 1. August 2022.*

SOIL - Blind Replicate Results

Sample Date		26/09/2024	26/09/2024	RPD
Sample Identification		**SG260924-01**	**SG260924-100**	
Analyte	Units			
Total Metals				
Arsenic	mg/kg	<4	<4	--
Cadmium	mg/kg	<0.4	<0.4	--
Chromium	mg/kg	7	7	0%
Copper	mg/kg	24	21	13%
Lead	mg/kg	190	160	17%
Mercury	mg/kg	0.1	0.1	0%
Nickel	mg/kg	6	6	0%
Zinc	mg/kg	210	190	10%
BTEXN				
Benzene	mg/kg	<0.2	<0.2	--
Toluene	mg/kg	<0.5	<0.5	--
Ethylbenzene	mg/kg	<1	<1	--
Total Xylenes	mg/kg	<1	<1	--
Naphthalene	mg/kg	<1	<1	--
Total Petroleum Hydrocarbons				
F1 (C6-C10)	mg/kg	<25	<25	--
F2 (>C10-C16)	mg/kg	<50	<50	--
F3 (>C16-C34)	mg/kg	240	150	46%
F4 (>C34-C40)	mg/kg	100	100	0%
Polycyclic Aromatic Hydrocarbons				
Naphthalene	mg/kg	0.8	<0.1	--
Acenaphthylene	mg/kg	0.9	0.2	**127%**
Acenaphthene	mg/kg	0.1	<0.1	--
Fluorene	mg/kg	0.7	<0.1	--
Phenanthrene	mg/kg	7.3	0.6	**170%**
Anthracene	mg/kg	1.2	0.2	**143%**
Fluoranthene	mg/kg	6.8	1.4	**132%**
Pyrene	mg/kg	5	1.3	**117%**
Benzo(a)anthracene	mg/kg	2.3	0.8	**97%**
Chrysene	mg/kg	2.1	0.8	**90%**
Benzo(b,j+k)fluoranthene	mg/kg	5.6	2.4	**80%**
Benzo(a)pyrene	mg/kg	1.9	0.77	**85%**
Indeno(1,2,3-c,d)pyrene	mg/kg	0.8	0.3	**91%**
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	--
Benzo(g,h,i)perylene	mg/kg	1	0.4	**86%**
Organochlorine Pesticides (OCP)				
Heptachlor	mg/kg	<0.1	<0.1	--
Aldrin	mg/kg	<0.1	<0.1	--
Dieldrin	mg/kg	<0.1	<0.1	--
Endrin	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	--
Endosulfan II	mg/kg	<0.1	<0.1	--
HCB	mg/kg	<0.1	<0.1	--
Methoxychlor	mg/kg	<0.1	<0.1	--
DDE + DDD + DDT	mg/kg	<0.1	<0.1	--
Remaining OCPs	mg/kg	<0.1	<0.1	--
PCBs				
Total PCBs	mg/kg	<0.1	<0.1	--

Values in Bold Indicate: RPD > 50 % When average concentration is > 10 x LOR
RPD > 75 % When average concentration is 5 to 10 x LOR
RPD > 150 % When average concentration is < 5 x LOR

SOIL - Split Duplicate Results

Sample Date		26/09/2024	26/09/2024	RPD
Sample Identification		**SG260924-15**	**SG260924-101**	
Analyte	Units			
Total Metals				
Arsenic	mg/kg	<4	<4	--
Cadmium	mg/kg	<0.4	<0.4	--
Chromium	mg/kg	7	5.1	31%
Copper	mg/kg	13	30	**79%**
Lead	mg/kg	88	270	**102%**
Mercury	mg/kg	<0.1	<0.1	--
Nickel	mg/kg	5	3.4	38%
Zinc	mg/kg	110	230	**71%**
BTEXN				
Benzene	mg/kg	<0.2	<0.2	--
Toluene	mg/kg	<0.5	<0.5	--
Ethylbenzene	mg/kg	<1	<1	--
Total Xylenes	mg/kg	<1	<3	--
Naphthalene	mg/kg	<1	<1	--
Total Petroleum Hydrocarbons				
F1 (C6-C10)	mg/kg	<25	<25	--
F2 (>C10-C16)	mg/kg	<50	<50	--
F3 (>C16-C34)	mg/kg	140	<100	--
F4 (>C34-C40)	mg/kg	<100	<100	--
Polycyclic Aromatic Hydrocarbons				
Naphthalene	mg/kg	<0.1	<0.1	--
Acenaphthylene	mg/kg	<0.1	0.13	**--**
Acenaphthene	mg/kg	<0.1	<0.1	--
Fluorene	mg/kg	<0.1	<0.1	--
Phenanthrene	mg/kg	0.4	0.64	46%
Anthracene	mg/kg	0.1	0.15	40%
Fluoranthene	mg/kg	1.6	1.1	37%
Pyrene	mg/kg	1.6	1	46%
Benzo(a)anthracene	mg/kg	1	0.36	**94%**
Chrysene	mg/kg	1	0.45	**76%**
Benzo(b,j+k)fluoranthene	mg/kg	3.4	0.82	**122%**
Benzo(a)pyrene	mg/kg	1.1	0.48	**78%**
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	0.32	44%
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	--
Benzo(g,h,i)perylene	mg/kg	0.6	0.31	64%
Organochlorine Pesticides (OCP)				
Heptachlor	mg/kg	<0.1	<0.1	--
Aldrin	mg/kg	<0.1	<0.1	--
Dieldrin	mg/kg	<0.1	<0.1	--
Endrin	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	--
Endosulfan II	mg/kg	<0.1	<0.1	--
HCB	mg/kg	<0.1	<0.1	--
Methoxychlor	mg/kg	<0.1	<0.1	--
DDE + DDD + DDT	mg/kg	<0.1	<0.1	--
Remaining OCPs	mg/kg	<0.1	<0.1	--
PCBs				
Total PCBs	mg/kg	<0.1	<0.1	--

Values in Bold Indicate: RPD > 50 % When average concentration is > 10 x LOR
RPD > 75 % When average concentration is 5 to 10 x LOR
RPD > 150 % When average concentration is < 5 x LOR

SOIL - Trip Blank Results

Laboratory:		Envirolab
Laboratory Report Number:		362821
Sample ID		**Trip Blank**
Analyte	Units	
BTEXN		
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
meta- & para-Xylene	mg/kg	<2
ortho-Xylene	mg/kg	<1
Total Xylenes	mg/kg	<1
Naphthalene	mg/kg	<1
Total Petroleum Hydrocarbons		
TRH C_6 - C_{10} (F1)	mg/kg	<25

Values in Bold Indicate: Detection above Laboratory Limit Of Reporting

SOIL - Trip Spike Results

Laboratory:		Envirolab
Laboratory Report Number:		362821
Sample ID		**Trip Spike**
Analyte	Units	
BTEXN		
Benzene	mg/kg	97
Toluene	mg/kg	97
Ethylbenzene	mg/kg	97
meta- & para-Xylene	mg/kg	97
ortho-Xylene	mg/kg	97

Values in Bold Indicate: Data Outside Acceptable Range of 70 - 130

SOIL - Rinsate Results

Laboratory Report Number:		362821
Sample ID		**SG260924-R**
Analyte	Units	
Total Metals		
Arsenic	mg/L	<0.05
Cadmium	mg/L	<0.01
Chromium	mg/L	<0.01
Copper	mg/L	<0.01
Lead	mg/L	<0.03
Mercury	mg/L	<0.0005
Nickel	mg/L	<0.02
Zinc	mg/L	<0.02
BTEXN		
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Total Petroleum Hydrocarbons		
F1 (C6-C10)	µg/L	<10
F2 (>C10-C16)	µg/L	<50
F3 (>C16-C34)	µg/L	<100
F4 (>C34-C40)	µg/L	<100

Values in Bold Indicate: Detection above Laboratory Limit Of Reporting

APPENDIX F

Laboratory Reports

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 362821

Client Details

Client	Geo-Environmental Engineering
Attention	Stephen McCormack
Address	82 Bridge St, Lane Cove, NSW, 2066

Sample Details

Your Reference	**E24017WB**
Number of Samples	24 Soil, 1 Water
Date samples received	26/09/2024
Date completed instructions received	27/09/2024

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	04/10/2024
Date of Issue	04/10/2024

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Asbestos Approved By
Analysed by Asbestos Approved Analyst: Amanda Lee
Authorised by Asbestos Approved Signatory: Nyovan Moonean

Results Approved By
Loren Bardwell, Development Chemist
Nyovan Moonean, Asbestos Approved Identifier/Counter
Tabitha Roberts, Senior Chemist
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		362821-1	362821-3	362821-5	362821-7	362821-8
Your Reference	UNITS	SG260924-01	SG260924-03	SG260924-05	SG260924-07	SG260924-08
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	02/10/2024	30/09/2024	30/09/2024
Date analysed	-	03/10/2024	03/10/2024	03/10/2024	03/10/2024	03/10/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH 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	%	92	80	75	86	92

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		362821-9	362821-10	362821-12	362821-15	362821-21
Your Reference	UNITS	SG260924-09	SG260924-10	SG260924-12	SG260924-15	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	03/10/2024	03/10/2024	03/10/2024	03/10/2024	03/10/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH 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	%	77	82	91	90	88

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		362821-24	362821-25
Your Reference	UNITS	Trip Blank	Trip Spike
Date Sampled		23/09/2024	23/09/2024
Type of sample		Soil	Soil
Date extracted	-	30/09/2024	30/09/2024
Date analysed	-	03/10/2024	03/10/2024
TRH C_6 - C_9	mg/kg	<25	[NA]
TRH C_6 - C_{10}	mg/kg	<25	[NA]
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	[NA]
Benzene	mg/kg	<0.2	97%
Toluene	mg/kg	<0.5	97%
Ethylbenzene	mg/kg	<1	97%
m+p-xylene	mg/kg	<2	97%
o-Xylene	mg/kg	<1	97%
Naphthalene	mg/kg	<1	[NA]
Total +ve Xylenes	mg/kg	<1	[NA]
Surrogate aaa-Trifluorotoluene	%	102	98

svTRH (C10-C40) in Soil						
Our Reference		362821-1	362821-3	362821-5	362821-7	362821-8
Your Reference	UNITS	SG260924-01	SG260924-03	SG260924-05	SG260924-07	SG260924-08
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	02/10/2024	02/10/2024	02/10/2024	02/10/2024
TRH C_{10} - C_{14}	mg/kg	<50	310	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	150	580	370	<100	160
TRH C_{29} - C_{36}	mg/kg	140	700	420	<100	250
Total +ve TRH (C10-C36)	mg/kg	290	1,600	790	<50	410
TRH >C_{10} -C_{16}	mg/kg	<50	290	55	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	290	55	<50	<50
TRH >C_{16} -C_{34}	mg/kg	240	1,100	660	160	330
TRH >C_{34} -C_{40}	mg/kg	100	450	290	<100	160
Total +ve TRH (>C10-C40)	mg/kg	350	1,800	1,000	160	500
Surrogate o-Terphenyl	%	96	98	100	89	89

svTRH (C10-C40) in Soil						
Our Reference		362821-9	362821-10	362821-12	362821-15	362821-21
Your Reference	UNITS	SG260924-09	SG260924-10	SG260924-12	SG260924-15	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	02/10/2024	02/10/2024	02/10/2024	02/10/2024	02/10/2024
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	110	150	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	140	170	<100	<100	110
Total +ve TRH (C10-C36)	mg/kg	250	320	<50	<50	110
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	200	270	<100	140	150
TRH >C_{34} -C_{40}	mg/kg	140	130	100	<100	100
Total +ve TRH (>C10-C40)	mg/kg	350	400	100	140	250
Surrogate o-Terphenyl	%	92	91	84	85	86

PAHs in Soil						
Our Reference		362821-1	362821-3	362821-5	362821-7	362821-8
Your Reference	UNITS	SG260924-01	SG260924-03	SG260924-05	SG260924-07	SG260924-08
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	02/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Naphthalene	mg/kg	0.8	0.1	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.9	0.2	0.3	0.2	0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.7	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	7.3	1	2.1	1.1	1.1
Anthracene	mg/kg	1.2	0.2	0.3	0.2	0.1
Fluoranthene	mg/kg	6.8	1.8	3.9	1.7	1.9
Pyrene	mg/kg	5.0	1.6	3.3	1.5	1.6
Benzo(a)anthracene	mg/kg	2.3	0.7	1.5	0.6	0.7
Chrysene	mg/kg	2.1	1.1	2.1	0.9	1.1
Benzo(b,j+k)fluoranthene	mg/kg	5.6	3.1	6.0	2.6	3.3
Benzo(a)pyrene	mg/kg	1.9	0.90	1.7	0.75	0.86
Indeno(1,2,3-c,d)pyrene	mg/kg	0.8	0.5	0.8	0.4	0.5
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	1	0.5	1.0	0.4	0.5
Total +ve PAH's	mg/kg	36	12	23	10	12
Benzo(a)pyrene TEQ calc (zero)	mg/kg	2.8	1.3	2.7	1.1	1.3
Benzo(a)pyrene TEQ calc(half)	mg/kg	2.8	1.4	2.7	1.2	1.4
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	2.9	1.4	2.7	1.2	1.4
Surrogate p-Terphenyl-d14	%	85	96	102	86	93

PAHs in Soil						
Our Reference		362821-9	362821-10	362821-12	362821-15	362821-21
Your Reference	UNITS	SG260924-09	SG260924-10	SG260924-12	SG260924-15	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.2	<0.1	<0.1	0.2
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	0.5	2.3	0.1	0.4	0.6
Anthracene	mg/kg	<0.1	0.3	0.2	0.1	0.2
Fluoranthene	mg/kg	0.9	3.0	0.2	1.6	1.4
Pyrene	mg/kg	0.8	2.4	0.2	1.6	1.3
Benzo(a)anthracene	mg/kg	0.4	0.9	0.1	1.0	0.8
Chrysene	mg/kg	0.6	1.3	0.1	1	0.8
Benzo(b,j+k)fluoranthene	mg/kg	2	3.5	0.4	3.4	2.4
Benzo(a)pyrene	mg/kg	0.52	1.0	0.1	1.1	0.77
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	0.5	<0.1	0.5	0.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.3	0.5	<0.1	0.6	0.4
Total +ve PAH's	mg/kg	6.0	16	1.5	11	9.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.8	1.5	<0.5	1.6	1.1
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.8	1.6	<0.5	1.7	1.2
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.9	1.6	<0.5	1.7	1.2
Surrogate p-Terphenyl-d14	%	92	91	91	96	91

PAHs in Soil		
Our Reference		362821-26
Your Reference	UNITS	SG260924-01 - [TRIPLICATE]
Date Sampled		26/09/2024
Type of sample		Soil
Date extracted	-	30/09/2024
Date analysed	-	01/10/2024
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	0.3
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	1.9
Anthracene	mg/kg	0.5
Fluoranthene	mg/kg	2.8
Pyrene	mg/kg	2.8
Benzo(a)anthracene	mg/kg	1.4
Chrysene	mg/kg	1.4
Benzo(b,j+k)fluoranthene	mg/kg	2
Benzo(a)pyrene	mg/kg	1.2
Indeno(1,2,3-c,d)pyrene	mg/kg	0.6
Dibenzo(a,h)anthracene	mg/kg	0.2
Benzo(g,h,i)perylene	mg/kg	0.7
Total +ve PAH's	mg/kg	16
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.8
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.8
Surrogate p-Terphenyl-d14	%	95

Organochlorine Pesticides in soil						
Our Reference		362821-1	362821-2	362821-3	362821-4	362821-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
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
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	80	92	97	98	106

Organochlorine Pesticides in soil						
Our Reference		362821-6	362821-7	362821-8	362821-9	362821-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
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
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	103	87	94	93	90

Organochlorine Pesticides in soil						
Our Reference		362821-11	362821-12	362821-13	362821-14	362821-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
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
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	91	92	94	87	86

Organochlorine Pesticides in soil				
Our Reference		362821-16	362821-17	362821-21
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	91	96	94

Organophosphorus Pesticides in Soil						
Our Reference		362821-2	362821-4	362821-6	362821-11	362821-13
Your Reference	UNITS	SG260924-02	SG260924-04	SG260924-06	SG260924-11	SG260924-13
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
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	%	92	98	103	91	94

Organophosphorus Pesticides in Soil				
Our Reference		362821-14	362821-16	362821-17
Your Reference	UNITS	SG260924-14	SG260924-16	SG260924-17
Date Sampled		26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024
Dichlorvos	mg/kg	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	87	91	96

PCBs in Soil						
Our Reference		362821-1	362821-3	362821-5	362821-7	362821-8
Your Reference	UNITS	SG260924-01	SG260924-03	SG260924-05	SG260924-07	SG260924-08
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
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	%	89	96	100	89	88

PCBs in Soil						
Our Reference		362821-9	362821-10	362821-12	362821-15	362821-21
Your Reference	UNITS	SG260924-09	SG260924-10	SG260924-12	SG260924-15	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
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	94	87	91	89

Acid Extractable metals in soil						
Our Reference		362821-1	362821-2	362821-3	362821-4	362821-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Arsenic	mg/kg	<4	<4	8	<4	<4
Cadmium	mg/kg	<0.4	1	4	0.8	1
Chromium	mg/kg	7	7	45	18	23
Copper	mg/kg	24	97	440	270	200
Lead	mg/kg	190	1,200	12,000	2,800	4,100
Mercury	mg/kg	0.1	0.3	2.6	0.7	3.8
Nickel	mg/kg	6	4	16	6	9
Zinc	mg/kg	210	730	11,000	2,400	2,300

Acid Extractable metals in soil						
Our Reference		362821-6	362821-7	362821-8	362821-9	362821-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Arsenic	mg/kg	5	<4	<4	5	<4
Cadmium	mg/kg	3	<0.4	1	0.8	<0.4
Chromium	mg/kg	270	4	8	15	7
Copper	mg/kg	420	42	110	180	41
Lead	mg/kg	14,000	400	4,100	2,000	1,100
Mercury	mg/kg	6.8	<0.1	0.2	0.9	0.2
Nickel	mg/kg	140	1	3	9	3
Zinc	mg/kg	9,600	180	2,200	1,300	470

Acid Extractable metals in soil						
Our Reference		362821-11	362821-12	362821-13	362821-14	362821-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Arsenic	mg/kg	<4	<4	7	<4	<4
Cadmium	mg/kg	<0.4	<0.4	0.7	<0.4	<0.4
Chromium	mg/kg	11	4	10	9	7
Copper	mg/kg	57	35	1,100	32	13
Lead	mg/kg	920	610	2,000	660	88
Mercury	mg/kg	0.2	0.1	0.5	0.3	<0.1
Nickel	mg/kg	2	1	5	6	5
Zinc	mg/kg	750	370	1,900	530	110

Acid Extractable metals in soil						
Our Reference		362821-16	362821-17	362821-18	362821-19	362821-20
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-19	SG260924-20
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	0.4	<0.4
Chromium	mg/kg	6	8	8	7	8
Copper	mg/kg	45	41	19	38	19
Lead	mg/kg	430	590	170	850	170
Mercury	mg/kg	0.2	0.3	<0.1	0.3	0.1
Nickel	mg/kg	4	4	5	2	9
Zinc	mg/kg	300	640	220	560	190

Acid Extractable metals in soil			
Our Reference		362821-21	362821-22
Your Reference	UNITS	SG260924-100	SG260924-21
Date Sampled		26/09/2024	26/09/2024
Type of sample		Soil	Soil
Date prepared	-	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024
Arsenic	mg/kg	<4	<4
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	7	4
Copper	mg/kg	21	4
Lead	mg/kg	160	13
Mercury	mg/kg	0.1	<0.1
Nickel	mg/kg	6	<1
Zinc	mg/kg	190	8

Moisture						
Our Reference		362821-1	362821-2	362821-3	362821-4	362821-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Moisture	%	12	8.6	65	45	65

Moisture						
Our Reference		362821-6	362821-7	362821-8	362821-9	362821-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Moisture	%	49	16	22	33	20

Moisture						
Our Reference		362821-11	362821-12	362821-13	362821-14	362821-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Moisture	%	17	14	30	21	9.4

Moisture						
Our Reference		362821-16	362821-17	362821-18	362821-19	362821-20
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-19	SG260924-20
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Moisture	%	22	20	14	28	16

Moisture			
Our Reference		362821-21	362821-22
Your Reference	UNITS	SG260924-100	SG260924-21
Date Sampled		26/09/2024	26/09/2024
Type of sample		Soil	Soil
Date prepared	-	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024
Moisture	%	9.6	9.8

Asbestos ID - soils						
Our Reference		362821-1	362821-2	362821-3	362821-4	362821-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	04/10/2024	04/10/2024	04/10/2024	04/10/2024	04/10/2024
Sample mass tested	g	Approx. 95g	Approx. 20g	Approx. 40g	Approx. 25g	Approx. 20g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-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	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
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		362821-6	362821-7	362821-8	362821-9	362821-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	04/10/2024	04/10/2024	04/10/2024	04/10/2024	04/10/2024
Sample mass tested	g	Approx. 35g	Approx. 80g	Approx. 35g	Approx. 25g	Approx. 25g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-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	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
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		362821-11	362821-12	362821-13	362821-14	362821-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	04/10/2024	04/10/2024	04/10/2024	04/10/2024	04/10/2024
Sample mass tested	g	Approx. 130g	Approx. 35g	Approx. 45g	Approx. 115g	Approx. 145g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-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	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
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils				
Our Reference		362821-16	362821-17	362821-21
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil
Date analysed	-	04/10/2024	04/10/2024	04/10/2024
Sample mass tested	g	Approx. 105g	Approx. 135g	Approx. 35g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-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
Asbestos comments	-	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected

vTRH(C6-C10)/BTEXN in Water		
Our Reference	UNITS	362821-23
Your Reference		SG260924-R
Date Sampled		26/09/2024
Type of sample		Water
Date extracted	-	02/10/2024
Date analysed	-	02/10/2024
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	100
Surrogate Toluene-d8	%	99
Surrogate 4-Bromofluorobenzene	%	98

svTRH (C10-C40) in Water		
Our Reference	UNITS	362821-23
Your Reference		SG260924-R
Date Sampled		26/09/2024
Type of sample		Water
Date extracted	-	01/10/2024
Date analysed	-	01/10/2024
TRH C_{10} - C_{14}	µg/L	<50
TRH C_{15} - C_{28}	µg/L	<100
TRH C_{29} - C_{36}	µg/L	<100
Total +ve TRH (C10-C36)	µg/L	<50
TRH >C_{10} - C_{16}	µg/L	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50
TRH >C_{16} - C_{34}	µg/L	<100
TRH >C_{34} - C_{40}	µg/L	<100
Total +ve TRH (>C10-C40)	µg/L	<50
Surrogate o-Terphenyl	%	87

Metals in Waters - Acid extractable		
Our Reference		362821-23
Your Reference	UNITS	SG260924-R
Date Sampled		26/09/2024
Type of sample		Water
Date prepared	-	01/10/2024
Date analysed	-	01/10/2024
Arsenic - Total	mg/L	<0.05
Cadmium - Total	mg/L	<0.01
Chromium - Total	mg/L	<0.01
Copper - Total	mg/L	<0.01
Lead - Total	mg/L	<0.03
Mercury - Total	mg/L	<0.0005
Nickel - Total	mg/L	<0.02
Zinc - Total	mg/L	<0.02

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	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. For soil results:- 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. 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.
Org-023	Water samples are analysed directly 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.
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)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
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)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. 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.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			03/10/2024	1	03/10/2024	03/10/2024		03/10/2024	03/10/2024
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	96	83
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	96	83
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	96	83
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	95	83
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	90	77
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	99	85
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	99	85
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	88	1	92	90	2	89	78

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	03/10/2024	03/10/2024		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	15	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	15	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	15	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	15	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	15	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	15	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	15	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	15	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	15	90	95	5	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	1	01/10/2024	02/10/2024		01/10/2024	02/10/2024
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	87	81
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	150	<100	40	91	113
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	140	130	7	86	104
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	87	81
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	240	180	29	91	113
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	100	120	18	86	104
Surrogate o-Terphenyl	%		Org-020	87	1	96	88	9	89	103

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	02/10/2024	02/10/2024		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	15	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	15	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	15	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	15	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	15	140	<100	33	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	15	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	15	85	86	1	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	1	02/10/2024	02/10/2024		01/10/2024	01/10/2024
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	0.8	<0.1	156	70	118
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	0.9	0.2	127	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	<0.1	0	72	120
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	0.7	<0.1	150	72	128
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	7.3	0.6	170	76	122
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	1.2	0.2	143	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	6.8	1.2	140	74	126
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	5.0	1.2	123	74	126
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	2.3	0.6	117	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	2.1	0.7	100	89	#
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	5.6	2.0	95	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	1.9	0.67	96	73	130
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	0.8	0.3	91	[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	1	0.4	86	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	97	1	85	88	3	87	100

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	01/10/2024	01/10/2024		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	15	0.4	0.2	67	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	15	0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	15	1.6	0.4	120	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	15	1.6	0.4	120	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	15	1.0	0.2	133	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	15	1	0.3	108	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	15	3.4	0.8	124	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	15	1.1	0.2	138	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	15	0.5	0.1	133	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	15	0.6	0.1	143	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	15	96	97	1	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	1	01/10/2024	01/10/2024		01/10/2024	01/10/2024
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	81
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	73	83
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	74	93
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	79	92
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	96
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	72	84
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	83	92
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	101
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	79	91
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	73	86
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	87	1	80	87	8	87	91

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	362821-4
Date extracted	-			[NT]	2	30/09/2024	30/09/2024		[NT]	30/09/2024
Date analysed	-			[NT]	2	01/10/2024	01/10/2024		[NT]	01/10/2024
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	87
HCB	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	90
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	100
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	102
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	101
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	96
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	102
Endrin	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	107
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	100
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	95
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	2	92	95	3	[NT]	102

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	01/10/2024	01/10/2024		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	15	86	95	10	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-4
Date extracted	-			30/09/2024	2	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	2	01/10/2024	01/10/2024		01/10/2024	01/10/2024
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	72	91
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	65	85
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	77	115
Malathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	69	96
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	67	91
Fenthion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	72	102
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	77	98
Phosalone	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	87	2	92	95	3	87	102

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	1	01/10/2024	01/10/2024		01/10/2024	01/10/2024
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	88	112
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	89	87	2	89	97

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	01/10/2024	01/10/2024		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	[NT]	15	91	87	4	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date prepared	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	111	102
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	102	89
Chromium	mg/kg	1	Metals-020	<1	1	7	8	13	101	97
Copper	mg/kg	1	Metals-020	<1	1	24	28	15	102	#
Lead	mg/kg	1	Metals-020	<1	1	190	200	5	103	##
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.1	0.1	0	91	#
Nickel	mg/kg	1	Metals-020	<1	1	6	8	29	100	91
Zinc	mg/kg	1	Metals-020	<1	1	210	220	5	101	##

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	362821-22
Date prepared	-			[NT]	15	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			[NT]	15	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Arsenic	mg/kg	4	Metals-020	[NT]	15	<4	<4	0	106	100
Cadmium	mg/kg	0.4	Metals-020	[NT]	15	<0.4	<0.4	0	99	93
Chromium	mg/kg	1	Metals-020	[NT]	15	7	7	0	98	93
Copper	mg/kg	1	Metals-020	[NT]	15	13	16	21	100	96
Lead	mg/kg	1	Metals-020	[NT]	15	88	94	7	100	95
Mercury	mg/kg	0.1	Metals-021	[NT]	15	<0.1	<0.1	0	99	90
Nickel	mg/kg	1	Metals-020	[NT]	15	5	7	33	97	92
Zinc	mg/kg	1	Metals-020	[NT]	15	110	120	9	98	91

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	21	30/09/2024	30/09/2024		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	21	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	21	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	21	7	7	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	21	21	25	17	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	21	160	190	17	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	21	0.1	0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	21	6	6	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	21	190	210	10	[NT]	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			02/10/2024	[NT]	[NT]	[NT]	[NT]	02/10/2024	[NT]
Date analysed	-			02/10/2024	[NT]	[NT]	[NT]	[NT]	02/10/2024	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	114	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	115	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	115	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	116	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	101	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate Toluene-d8	%		Org-023	98	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	91	[NT]	[NT]	[NT]	[NT]	111	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			01/10/2024	[NT]	[NT]	[NT]	[NT]	01/10/2024	[NT]
Date analysed	-			01/10/2024	[NT]	[NT]	[NT]	[NT]	01/10/2024	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	96	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	93	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	96	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	93	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate o-Terphenyl	%		Org-020	76	[NT]	[NT]	[NT]	[NT]	117	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			01/10/2024	[NT]	[NT]	[NT]	[NT]	01/10/2024	[NT]
Date analysed	-			01/10/2024	[NT]	[NT]	[NT]	[NT]	01/10/2024	[NT]
Arsenic - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	106	[NT]
Cadmium - Total	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	102	[NT]
Chromium - Total	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	100	[NT]
Copper - Total	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	105	[NT]
Lead - Total	mg/L	0.03	Metals-020	<0.03	[NT]	[NT]	[NT]	[NT]	101	[NT]
Mercury - Total	mg/L	0.0005	Metals-021	<0.0005	[NT]	[NT]	[NT]	[NT]	107	[NT]
Nickel - Total	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	104	[NT]
Zinc - Total	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	99	[NT]

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

8 metals in soil:
- # 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.
- ## Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

PAHs in Soil:
- # Percent recovery for the surrogate/matrix spike is not possible to report as the high concentration of analytes in sample/s 362821-3ms have caused interference.
- The laboratory RPD acceptance criteria has been exceeded for 362821-1. Therefore a triplicate result has been issued as laboratory sample number 362821-26.
- The RPD for duplicate results is accepted due to the non homogenous nature of sample s362821-1,1d 15,15d

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: Sample 362821-21 was sub-sampled from jar provided by the client.

COC 27/9/24 0912

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	Geo-Environmental Engineering Pty Ltd
Project Mgr:	Stephen McCormack
Sampler:	Stephen Mccormack
Address:	Unit 2, 5-7 Malta Street, Fairfield East
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au
Phone:	0458 550 257 (Sally) / 0431 480 980 (Stephen)

Client Project Name and Number: E24017WB

PO No.:

Envirolab Services Quote No. :

Date results required:

Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard**

Note: Inform lab in advance if urgent turnaround is required - surcharge applies

Envirolab Services
12 Ashley St, Chatswood, NSW, 2067

Phone: 02 9910 6200
Fax: 02 9910 6201

E-mail: ahie@envirolabservices.com.au

Contact: Aileen Hie / Simon Song

Sample information				Tests Required												Comments
Envirolab Sample ID	Client Sample ID	Date sampled	Type of sample	Combination 5a	Combination 5	Combination 3a	Combination 3	Metals Std 8	TRH (vol)/BTEXN	BTEXN	Asbestos ID	OCP/OPPs	Combination 1m				Hold	Provide as much information about the sample as you can
1	SG260924-01	26/09/2024	Soil	1														
2	SG260924-02	26/09/2024	Soil					1			1	1						
3	SG260924-03	26/09/2024	Soil	1														
4	SG260924-04	26/09/2024	Soil					1			1	1						
5	SG260924-05	26/09/2024	Soil	1														
6	SG260924-06	26/09/2024	Soil					1			1	1						
7	SG260924-07	26/09/2024	Soil	1														
8	SG260924-08	26/09/2024	Soil	1														
9	SG260924-09	26/09/2024	Soil	1														
10	SG260924-10	26/09/2024	Soil	1														
11	SG260924-11	26/09/2024	Soil					1			1	1						
12	SG260924-12	26/09/2024	Soil	1														
13	SG260924-13	26/09/2024	Soil					1			1	1						
14	SG260924-14	26/09/2024	Soil					1			1	1						

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 362821

Date Received: 26/9/24
Time Received: 1125
Received By: EW
Temp: Cool/Ambient
Cooling: Ice/Icepack 6°C
Security: Intact/Broken/None

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):**	ELS SYD
Print Name:	Sally Gartland	**Print Name:**	EMMA W
Date & Time:	26-Sep-24	**Date & Time:**	26/9/24 1125.
Signature:	SG	**Signature:**	EW

Samples Received: Cool or Ambient (circle one)
Temperature Recieved at: 6°C (if applicable)
Transported by: Hand delivered / courier

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	Geo-Environmental Engineering Pty Ltd	**Client Project Name and Number:** E24017WB	**Envirolab Services** 12 Ashley St, Chatswood, NSW, 2067
Project Mgr:	Stephen McCormack	**PO No.:**	**Phone: 02 9910 6200** **Fax: 02 9910 6201**
Sampler:	Stephen Mccormack	**Envirolab Services Quote No. :**	
Address:	Unit 2, 5-7 Malta Street, Fairfield East	**Date results required:**	**E-mail: ahie@envirolabservices.com.au**
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au	Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard** *Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Contact: Aileen Hie / Simon Song**
Phone:	0458 550 257 (Sally) / 0431 480 980 (Stephen)		

Sample information				Tests Required												Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**Combination 5a**	**Combination 5**	**Combination 3a**	**Combination 3**	**Metals Std 8**	**TRH (vol)/BTEXN**	**BTEXN**	**Asbestos ID**	**OCP/OPPs**	**Combination 1m**			**Hold**	**Provide as much information about the sample as you can**
15	SG260924-15	26/09/2024	Soil	1													
16	SG260924-16	26/09/2024	Soil					1			1	1					
17	SG260924-17	26/09/2024	Soil					1			1	1					
18	SG260924-18	26/09/2024	Soil					1									
19	SG260924-19	26/09/2024	Soil					1									
20	SG260924-20	26/09/2024	Soil					1									
22 ~~NR~~ KW	SG260924-21	26/09/2024	Soil					1									
21	SG260924-100	26/09/2024	Soil	1													
24 ~~NR~~ SP	Trip Blank	26/09/2024	Soil						1								
25 ~~NR~~ SP	Trip Spike	26/09/2024	Soil							1							
23 ~~NR~~ KW	SG260924-R	26/09/2024	Water										1				
~~EW Extra 22~~	~~Unlabelled bag~~																

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):**	**Samples Received: Cool or Ambient (circle one)**
Print Name:	Sally Gartland	**Print Name:**	**Temperature Recieved at: (if applicable)**
Date & Time:	26-Sep-24	**Date & Time:** 26/9 1125	**Transported by: Hand delivered / courier**
Signature:	SG	**Signature:** EW	362821. **Page No: 2 of 2**

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	Geo-Environmental Engineering Pty Ltd	**Client Project Name and Number:** E24017WB	**Envirolab Services** 25 Research Dr, Croydon South VIC 3136
Project Mgr:	Stephen McCormack	**PO No.:**	**Phone: 02 9910 6200**
Sampler:	Stephen Mccormack	**Envirolab Services Quote No. :**	**Fax: 02 9910 6201**
Address:	Unit 2, 5-7 Malta Street, Fairfield East	**Date results required:**	**E-mail: ahie@envirolabservices.com.au**
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au	Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard** *Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Contact: Aileen Hie / Simon Song**
Phone:	0458 550 257 (Sally) / 0431 480 980 (Stephen)		

Sample information				Tests Required														Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**Combination 5a**	**Combination 5**	**Combination 3a**	**Combination 3**	**Metals Std 8**	**TRH (vol)/BTEXN**	**BTEXN**	**Asbestos ID**	**OCP/OPPs**	**Combination 1m**					**Hold**	**Provide as much information about the sample as you can**
	SG260924-101	26/09/2024	Soil		1														

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):**	**Samples Received: Cool or Ambient (circle one)**
Print Name:	Sally Gartland	**Print Name:**	**Temperature Recieved at: (if applicable)**
Date & Time:	26-Sep-24	**Date & Time:**	**Transported by: Hand delivered / courier**
Signature:	SG	**Signature:**	**Page No: 1 of 1**

362821
26/9
GW

Follow us on: LinkedIn | Facebook | Twitter

Price Increase: We will be having a CPI increase July 2024. Your on-line price list will be updated automatically.

Please consider the environment before printing this email.

#362821
26/9 KW

Samples will be analysed per our T&C's.

The content of this email and any attachments are intended solely for the addressee(s), may contain confidential and/or privileged information and may b unauthorised use is expressly prohibited. If you have received this email in error please promptly notify the sender, disregard and then delete the email. An are those of the individual sender. This email may have been corrupted or interfered with. Envirolab Group Pty Ltd cannot guarantee that the message you r Envirolab Group does not represent, warrant or guarantee that the communication is free from errors, virus or interference. In the event of any discrepancy the paper version is to take precedent. Envirolab Group accepts no liability for any damage caused by this email or its attachments due to viruses, interference access. Envirolab Group's entire liability is limited to resending this email.

This e-mail message has been scanned for Viruses

From: Sally Gartland <sally@geoenvironmental.com.au>
Sent: Friday, September 27, 2024 9:11 AM
To: SydneyMailbox <Sydney@envirolab.com.au>; Login <Login@envirolab.com.au>
Cc: Stephen McCormack <stephen@geoenvironmental.com.au>
Subject: GEE: Sample CoC for soil samples

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Hello Envirolab team,

I hope you are well! Please see attached the CoC's for the samples already at your lab.

Please note that the sample 'SG260924-R' will be arriving this afternoon.

If any questions or concerns, please let me know. ☺

All the best,

Sally Gartland
Environmental Scientist
Geo-Environmental Engineering
Unit 2 / 5-7 Malta Street
Fairfield East NSW 2165
T 02 9420 3361
M 0458 550 257

www.geoenvironmental.com.au

Kind regards,

Sally Gartland
Environmental Scientist
Geo-Environmental Engineering
Unit 2 / 5-7 Malta Street
Fairfield East NSW 2165
T 02 9420 3361
M 0458 550 257

www.geoenvironmental.com.au

#362821
26/9 KW

From: Sarah Park <SPark@envirolab.com.au>
Sent: Friday, September 27, 2024 4:36 PM
To: Sally Gartland <sally@geoenvironmental.com.au>
Cc: Stephen McCormack <stephen@geoenvironmental.com.au>; Envirolab Sydney Sample Receipt <Samplereceipt@envirolab.com.au>
Subject: RE: GEE: Sample CoC for soil samples

Hi Sally,

Thanks for the CoC for the sample.

Just double checking that we did not receive Trip Blank and Trip Spike for this batch – would you be sending them with the sample 'SG260924-R'?
Also, we received 1 x 500mL bag of soil sample that had no sample ID labelled on it. We have added onto the CoC as an extra sample #22.

Could you please confirm what this sample might be?

Please refer to the attached CoC for your reference.

Kind Regards,

Sarah Park | Customer Service | Envirolab Services

Great Science. Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200
E SPark@envirolab.com.au | **W** www.envirolab.com.au

Follow us on: LinkedIn | Facebook | Twitter

Samples will be analysed per our T&C's.

From: Joy Toh <JToh@envirolab.com.au>
Sent: Friday, 27 September 2024 9:14 AM
To: Login <Login@envirolab.com.au>; Envirolab Sydney Sample Receipt <Samplereceipt@envirolab.com.au>
Subject: Fw: GEE: Sample CoC for soil samples

Kind Regards,

Joy Toh | Reception | Envirolab Services

Great Science. Great Service.

Sarah Park

From: Sally Gartland <sally@geoenvironmental.com.au>
Sent: Friday, 27 September 2024 4:58 PM
To: Sarah Park
Cc: Stephen McCormack; Envirolab Sydney Sample Receipt
Subject: Re: GEE: Sample CoC for soil samples

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Hi Sarah,

#362821
26/9 KW

Thank you very much for your email.

That blank bag would be sample SG260924-21 (I have a photo record of this taken at the time as I was sampling in the rain).

With the trip blank and spike I'm just checking something on my end and I'll get back to you about it.

Thank you for your help with this. ☺

Sarah Park

From: Sally Gartland <sally@geoenvironmental.com.au>
Sent: Friday, 27 September 2024 7:15 PM
To: Sarah Park
Cc: Stephen McCormack; Envirolab Sydney Sample Receipt
Subject: Re: GEE: Sample CoC for soil samples

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Hi Sarah,

I think I know what's happened, the soil TS/TB may have been in the eskies containing groundwater samples that we dropped to you on the same day. I don't think I've received the sample receipt for those groundwater samples just yet so they must be at login still.

There's also a water trip blank in there which is listed on the groundwater CoC.

Hopefully this helps. 😊

Please let me know if there's any further issues. Thank you for your help. 😊

Kind regards,

Sally

Sent from my iPhone

> On 27 Sep 2024, at 5:55 pm, Sarah Park <SPark@envirolab.com.au> wrote:
>
> Hi Sally,
>
> Thanks for the email – will update the extra sample to be 'SG260924-21'.
> Will keep an eye out for any updates from you.
>
> Have a good weekend!
>
> **Kind Regards,**
>
> **Sarah Park | Customer Service | Envirolab Services**
>
> **Great Science. Great Service.**
>
> 12 Ashley Street Chatswood NSW 2067
> **T** 612 9910 6200
> **E** SPark@envirolab.com.au | **W** www.envirolab.com.au
>
> **Follow us on:** LinkedIn | Facebook | Twitter

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 362821-A

Client Details

Client	Geo-Environmental Engineering
Attention	Stephen McCormack
Address	82 Bridge St, Lane Cove, NSW, 2066

Sample Details

Your Reference	**E24017WB**
Number of Samples	Additional analysis
Date samples received	26/09/2024
Date completed instructions received	04/10/2024

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.

Report Details

Date results requested by	11/10/2024
Date of Issue	11/10/2024

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Results Approved By
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

PAHs in Soil						
Our Reference		362821-A-16	362821-A-17	362821-A-18	362821-A-20	362821-A-22
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-20	SG260924-21
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	10/10/2024	10/10/2024	10/10/2024	10/10/2024	10/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	0.5	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	0.5	2.0	0.7	0.2	<0.1
Anthracene	mg/kg	0.1	0.5	0.1	<0.1	<0.1
Fluoranthene	mg/kg	1.1	4.7	1.3	0.4	<0.1
Pyrene	mg/kg	1.0	4.4	1.2	0.3	<0.1
Benzo(a)anthracene	mg/kg	0.5	2.4	0.6	0.2	<0.1
Chrysene	mg/kg	0.6	2.5	0.6	0.2	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.9	4.0	0.8	0.3	<0.2
Benzo(a)pyrene	mg/kg	0.52	2.5	0.5	0.2	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	1.2	0.2	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.1	0.4	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.4	1.5	0.3	0.1	<0.1
Total +ve PAH's	mg/kg	6.0	27	6.4	1.8	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.8	3.7	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.8	3.7	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.8	3.7	0.8	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	108	106	103	107	96

Method ID	Methodology Summary
Org-022/025	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. For soil results:- 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. 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.

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date extracted	-			10/10/2024	[NT]	[NT]	[NT]	[NT]	10/10/2024	[NT]
Date analysed	-			11/10/2024	[NT]	[NT]	[NT]	[NT]	11/10/2024	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	80	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	78	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	76	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	96	[NT]	[NT]	[NT]	[NT]	91	[NT]

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.

Anna Bui

From: Stephen McCormack <stephen@geoenvironmental.com.au>
Sent: Friday, 4 October 2024 3:58 PM
To: Greta Petzold; Envirolab Sydney Sample Receipt; Simon Song
Subject: RE: Results for Registration 362821 E24017WB

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Can you please test the following samples for PAHs. Std turnaround or 4days if you can
16 SG260924-16
17 SG260924-17
18 SG260924-18
20 SG260924-20
22 SG260924-21

ES REF: 362821-A
TAT: STANDARD
DUE: 11/10/24
AB.

Thanks

Stephen McCormack B. Eng (Civil) – MIEAust, CPEng, NER, CEnvP
Director
Geo-Environmental Engineering
Unit 2 / 5-7 Malta Street
Fairfield East NSW 2165
M 0431 480 980

www.geoenvironmental.com.au

From: Greta Petzold <GPetzold@envirolab.com.au>
Sent: Friday, 4 October 2024 2:49 PM
To: Sally Gartland <sally@geoenvironmental.com.au>; Stephen McCormack <stephen@geoenvironmental.com.au>
Subject: Results for Registration 362821 E24017WB

Please refer to attached for:
a copy of the Certificate of Analysis
a copy of the COC/paperwork received from you
an Excel or .csv file containing the results
a copy of the Invoice

Please note that a hard copy will not be posted.

Enquiries should be made directly to:
customerservice@envirolab.com.au

How did we do? Send Feedback

Kind Regards,

Greta Petzold | Operations Manager | Envirolab Services

Great Science. Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200
E GPetzold@envirolab.com.au | **W** www.envirolab.com.au

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 362821-B

Client Details

Client	Geo-Environmental Engineering
Attention	Sally Gartland
Address	82 Bridge St, Lane Cove, NSW, 2066

Sample Details

Your Reference	**E24017WB**
Number of Samples	Additional analysis
Date samples received	26/09/2024
Date completed instructions received	09/10/2024

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	16/10/2024
Date of Issue	16/10/2024

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Tabitha Roberts, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		362821-B-1	362821-B-2	362821-B-3	362821-B-4	362821-B-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
pH 1:5 soil:water	pH Units	6.9	7.1	8.1	7.9	8.1

Misc Inorg - Soil						
Our Reference		362821-B-6	362821-B-7	362821-B-8	362821-B-9	362821-B-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
pH 1:5 soil:water	pH Units	8.2	7.9	7.9	7.0	7.9

Misc Inorg - Soil						
Our Reference		362821-B-11	362821-B-12	362821-B-13	362821-B-14	362821-B-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
pH 1:5 soil:water	pH Units	7.9	8.1	7.3	6.9	6.5

Misc Inorg - Soil						
Our Reference		362821-B-16	362821-B-17	362821-B-18	362821-B-19	362821-B-20
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-19	SG260924-20
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
pH 1:5 soil:water	pH Units	7.8	7.2	6.7	6.4	6.4

Misc Inorg - Soil		
Our Reference		362821-B-22
Your Reference	UNITS	SG260924-21
Date Sampled		26/09/2024
Type of sample		Soil
Date prepared	-	11/10/2024
Date analysed	-	11/10/2024
pH 1:5 soil:water	pH Units	6.8

CEC						
Our Reference		362821-B-1	362821-B-2	362821-B-3	362821-B-4	362821-B-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Date analysed	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	8.0	13	13	6.7	7.3
Exchangeable K	meq/100g	0.2	0.3	0.2	0.1	0.1
Exchangeable Mg	meq/100g	1.3	3.3	2.0	1.3	1.1
Exchangeable Na	meq/100g	<0.1	0.5	0.3	0.2	0.2
Cation Exchange Capacity	meq/100g	9.5	17	16	8.4	8.6

CEC						
Our Reference		362821-B-6	362821-B-7	362821-B-8	362821-B-9	362821-B-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Date analysed	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	9.9	1.0	4.7	6.2	2.7
Exchangeable K	meq/100g	0.2	<0.1	0.1	0.3	0.1
Exchangeable Mg	meq/100g	1.8	0.7	0.9	3.5	1.1
Exchangeable Na	meq/100g	0.3	<0.1	0.1	0.2	0.1
Cation Exchange Capacity	meq/100g	12	1.8	5.8	10	4.0

CEC						
Our Reference		362821-B-11	362821-B-12	362821-B-13	362821-B-14	362821-B-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Date analysed	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	3.6	2.2	4.3	5.3	3.7
Exchangeable K	meq/100g	0.1	<0.1	<0.1	0.1	0.2
Exchangeable Mg	meq/100g	1.2	0.8	0.9	1.6	1.6
Exchangeable Na	meq/100g	<0.1	<0.1	<0.1	<0.1	<0.1
Cation Exchange Capacity	meq/100g	5.0	3.1	5.3	7.1	5.6

CEC						
Our Reference		362821-B-16	362821-B-17	362821-B-18	362821-B-19	362821-B-20
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-19	SG260924-20
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Date analysed	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	19	14	8.2	5.5	6.9
Exchangeable K	meq/100g	0.2	0.3	0.3	0.4	0.2
Exchangeable Mg	meq/100g	4.0	3.6	2.2	3.2	2.6
Exchangeable Na	meq/100g	0.1	0.2	<0.1	0.3	<0.1
Cation Exchange Capacity	meq/100g	23	18	11	9.4	9.8

CEC		
Our Reference		362821-B-22
Your Reference	UNITS	SG260924-21
Date Sampled		26/09/2024
Type of sample		Soil
Date prepared	-	15/10/2024
Date analysed	-	15/10/2024
Exchangeable Ca	meq/100g	0.6
Exchangeable K	meq/100g	<0.1
Exchangeable Mg	meq/100g	0.8
Exchangeable Na	meq/100g	0.1
Cation Exchange Capacity	meq/100g	1.5

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			11/10/2024	1	11/10/2024	11/10/2024		11/10/2024	[NT]
Date analysed	-			11/10/2024	1	11/10/2024	11/10/2024		11/10/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	6.9	6.8	1	100	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-			[NT]	11	11/10/2024	11/10/2024		11/10/2024	[NT]
Date analysed	-			[NT]	11	11/10/2024	11/10/2024		11/10/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	11	7.9	8.0	1	100	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	22	11/10/2024	11/10/2024		[NT]	[NT]
Date analysed	-			[NT]	22	11/10/2024	11/10/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	22	6.8	6.7	1	[NT]	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	362821-B-22
Date prepared	-			15/10/2024	2	15/10/2024	15/10/2024		15/10/2024	15/10/2024
Date analysed	-			15/10/2024	2	15/10/2024	15/10/2024		15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	2	13	11	17	91	76
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	2	0.3	0.3	0	97	77
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	2	3.3	2.9	13	90	74
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	2	0.5	0.3	50	99	84

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	15/10/2024	15/10/2024		[NT]	[NT]
Date analysed	-			[NT]	11	15/10/2024	15/10/2024		[NT]	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	[NT]	11	3.6	3.4	6	[NT]	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	[NT]	11	0.1	0.1	0	[NT]	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	[NT]	11	1.2	1.2	0	[NT]	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	[NT]	11	<0.1	<0.1	0	[NT]	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	20	15/10/2024	15/10/2024		[NT]	[NT]
Date analysed	-			[NT]	20	15/10/2024	15/10/2024		[NT]	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	[NT]	20	6.9	7.1	3	[NT]	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	[NT]	20	0.2	0.2	0	[NT]	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	[NT]	20	2.6	2.6	0	[NT]	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	[NT]	20	<0.1	<0.1	0	[NT]	[NT]

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

Samples received in good order: Holding time exceedance

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	**Geo-Environmental Engineering Pty Ltd**	**Client Project Name and Number:**	**Envirolab Services**
Project Mgr:	**Stephen McCormack**	E24017WB	**12 Ashley St, Chatswood, NSW, 2067**
Sampler:	**Stephen Mccormack**	**PO No.:**	**Phone: 02 9910 6200**
Address:	**Unit 2, 5-7 Malta Street, Fairfield East**	**Envirolab Services Quote No. :**	**Fax: 02 9910 6201**
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au	**Date results required:**	**E-mail: ahie@envirolabservices.com.au**
		Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard**	**Contact: Aileen Hie / Simon Song**
Phone:	**0458 550 257 (Sally) / 0431 480 980 (Stephen)**	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	

Sample information				Tests Required														Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**pH**	**CeC**												**Hold**	**Provide as much information about the sample as you can**
1	SG260924-01	26/09/2024	Soil	1	1													
2	SG260924-02	26/09/2024	Soil	1	1													
3	SG260924-03	26/09/2024	Soil	1	1													
4	SG260924-04	26/09/2024	Soil	1	1													
5	SG260924-05	26/09/2024	Soil	1	1													
6	SG260924-06	26/09/2024	Soil	1	1													
7	SG260924-07	26/09/2024	Soil	1	1													
8	SG260924-08	26/09/2024	Soil	1	1													
9	SG260924-09	26/09/2024	Soil	1	1													
10	SG260924-10	26/09/2024	Soil	1	1													
11	SG260924-11	26/09/2024	Soil	1	1													
12	SG260924-12	26/09/2024	Soil	1	1													
13	SG260924-13	26/09/2024	Soil	1	1													
14	SG260924-14	26/09/2024	Soil	1	1													

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):**	ELS SYD	**Samples Received: Cool or Ambient (circle one)**
Print Name:	Sally Gartland	**Print Name:**	A. Bal	**Temperature Recieved at:** **(if applicable)**
Date & Time:	Requested digitally 9/10/24	**Date & Time:**	9/10/24 1153	**Transported by: Hand delivered / courier**
Signature:	SG	**Signature:**		**Page No: 1 of 2**

362821-B

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	**Geo-Environmental Engineering Pty Ltd**	**Client Project Name and Number:** E24017WB	**Envirolab Services** **12 Ashley St, Chatswood, NSW, 2067**
Project Mgr:	**Stephen McCormack**	**PO No.:**	**Phone: 02 9910 6200**
Sampler:	**Stephen Mccormack**	**Envirolab Services Quote No. :**	**Fax: 02 9910 6201**
Address:	**Unit 2, 5-7 Malta Street, Fairfield East**	**Date results required:**	**E-mail: ahie@envirolabservices.com.au**
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au	Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard** *Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Contact: Aileen Hie / Simon Song**
Phone:	**0458 550 257 (Sally) / 0431 480 980 (Stephen)**		

Sample information				Tests Required														Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**pH**	**CeC**												**Hold**	**Provide as much information about the sample as you can**
15	SG260924-15	26/09/2024	Soil	1	1													
16	SG260924-16	26/09/2024	Soil	1	1													
17	SG260924-17	26/09/2024	Soil	1	1													
18	SG260924-18	26/09/2024	Soil	1	1													
19	SG260924-19	26/09/2024	Soil	1	1													
20	SG260924-20	26/09/2024	Soil	1	1													
22	SG260924-21	26/09/2024	Soil	1	1													
24	SG260924-100	26/09/2024	Soil														1	
	Trip Blank	26/09/2024	Soil														1	
	Trip Spike	26/09/2024	Soil														1	
	SG260924-R	26/09/2024	Water														1	

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):** ELS SMD	**Samples Received: Cool or Ambient (circle one)**	
Print Name:	Sally Gartland	**Print Name:** A.BU	**Temperature Recieved at:**	**(if applicable)**
Date & Time:	Requested digitally 9/10/24	**Date & Time:** 9/10/24 1153	**Transported by: Hand delivered / courier**	
Signature:	SG	**Signature:**	**Page No: 2 of 2**	

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph +61 3 9763 2500
melbourne@envirolab.com.au
www.envirolab.com.au

Certificate of Analysis MFJ0016

Client Details

Client	Geo-Environmental Engineering Pty Ltd
Contact	Stephen McCormack
Address	82 Bridge Street, LANE COVE, NSW, 2066

Sample Details

Your Reference	E24017WB
Number of Samples	1 Soil
Date Samples Received	01/10/2024
Date Instructions Received	01/10/2024

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 soils and on an as received basis for other matrices.

Report Details

Date Results Requested by	07/10/2024
Date of Issue	04/10/2024

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Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Tara White, Metals Supervisor Tianna Milburn, Senior Chemist
Laboratory Manager	Pamela Adams

Certificate of Analysis MFJ0016

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
MFJ0016-01	SG260924-101	Soil	26/09/2024	01/10/2024

Volatile TRH and BTEX (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
TRH C6-C9	mg/kg	25	<25
TRH C6-C10	mg/kg	25	<25
TRH C6-C10 less BTEX (F1)	mg/kg	25	<25
Methyl tert butyl ether (MTBE)	mg/kg	0.50	<0.50
Benzene	mg/kg	0.20	<0.20
Toluene	mg/kg	0.50	<0.50
Ethylbenzene	mg/kg	1.0	<1.0
meta+para Xylene	mg/kg	2.0	<2.0
ortho-Xylene	mg/kg	1.0	<1.0
Total Xylene	mg/kg	3.0	<3.0
Naphthalene (value used in F2 calc)	mg/kg	1.0	<1.0
Surrogate aaa-Trifluorotoluene	%		*82.6*

Semi-volatile TRH (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
TRH C10-C14	mg/kg	50	<50
TRH C15-C28	mg/kg	100	<100
TRH C29-C36	mg/kg	100	<100
Total +ve TRH C10-C36	mg/kg	50	<50
TRH >C10-C16	mg/kg	50	<50
TRH >C10-C16 less Naphthalene F2	mg/kg	50	<50
TRH >C16-C34 (F3)	mg/kg	100	<100
TRH >C34-C40 (F4)	mg/kg	100	<100
Total +ve TRH >C10-C40	mg/kg	50	<50
Surrogate o-Terphenyl	%		*84.1*

Polycyclic Aromatic Hydrocarbons (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
Naphthalene	mg/kg	0.10	<0.10
Acenaphthylene	mg/kg	0.10	0.13
Acenaphthene	mg/kg	0.10	<0.10
Fluorene	mg/kg	0.10	<0.10
Phenanthrene	mg/kg	0.10	0.64
Anthracene	mg/kg	0.10	0.15
Fluoranthene	mg/kg	0.10	1.1
Pyrene	mg/kg	0.10	1.0
Benzo(a)anthracene	mg/kg	0.10	0.36
Chrysene	mg/kg	0.10	0.45
Benzo(b,j,k)fluoranthene	mg/kg	0.20	0.82
Benzo(a)pyrene	mg/kg	0.050	0.48
Indeno(1,2,3-c,d)pyrene	mg/kg	0.10	0.32
Dibenzo(a,h)anthracene	mg/kg	0.10	<0.10
Benzo(g,h,i)perylene	mg/kg	0.10	0.31
Total +ve PAH	mg/kg	0.050	5.8
Benzo(a)pyrene TEQ calc zero	mg/kg	0.50	0.64
Benzo(a)pyrene TEQ calc Half	mg/kg	0.50	0.69
Benzo(a)pyrene TEQ calc PQL	mg/kg	0.50	0.74
Surrogate p-Terphenyl-D14	%		*110*

Organochlorine Pesticides (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
alpha-BHC	mg/kg	0.10	<0.10
Hexachlorobenzene	mg/kg	0.10	<0.10
beta-BHC	mg/kg	0.10	<0.10
gamma-BHC	mg/kg	0.10	<0.10
delta-BHC	mg/kg	0.10	<0.10
Heptachlor	mg/kg	0.10	<0.10
Aldrin	mg/kg	0.10	<0.10
Heptachlor epoxide	mg/kg	0.10	<0.10
trans-Chlordane	mg/kg	0.10	<0.10
cis-Chlordane	mg/kg	0.10	<0.10
Endosulfan I	mg/kg	0.10	<0.10
4,4'-DDE	mg/kg	0.10	<0.10
Dieldrin	mg/kg	0.10	<0.10
Endrin	mg/kg	0.10	<0.10
4,4'-DDD	mg/kg	0.10	<0.10
Endosulfan II	mg/kg	0.10	<0.10
Endrin aldehyde	mg/kg	0.10	<0.10
4,4'-DDT	mg/kg	0.10	<0.10
Endosulfan sulfate	mg/kg	0.10	<0.10
Endrin ketone	mg/kg	0.10	<0.10
Methoxychlor	mg/kg	0.10	<0.10
Mirex	mg/kg	0.10	<0.10
Total +ve DDT+DDD+DDE	mg/kg	0.10	<0.10
Total +ve Aldrin + Dieldrin	mg/kg	0.10	<0.10
Total +ve OCP	mg/kg	0.10	<0.10
Surrogate 4-chloro-3-nitrobenzotrifluoride	%		*87.9*

Polychlorinated Biphenyls (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
Aroclor 1016	mg/kg	0.10	<0.10
Aroclor 1221	mg/kg	0.10	<0.10
Aroclor 1232	mg/kg	0.10	<0.10
Aroclor 1242	mg/kg	0.10	<0.10
Aroclor 1248	mg/kg	0.10	<0.10
Aroclor 1254	mg/kg	0.10	<0.10
Aroclor 1260	mg/kg	0.10	<0.10
Total +ve PCB (1016-1260)	mg/kg	0.10	<0.10
Surrogate 2-Fluorobiphenyl	%		*104*

Certificate of Analysis MFJ0016

Acid Extractable Metals (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
Arsenic	mg/kg	4.0	<4.0
Cadmium	mg/kg	0.40	<0.40
Chromium	mg/kg	1.0	5.1
Copper	mg/kg	1.0	30
Mercury	mg/kg	0.10	<0.10
Nickel	mg/kg	1.0	3.4
Lead	mg/kg	1.0	270
Zinc	mg/kg	1.0	230

Certificate of Analysis MFJ0016

Inorganics - Moisture (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
Moisture	%	0.10	13

Method Summary

Method ID	Methodology Summary
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-OES.
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. 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_PCB	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS.
ORG-022_OC	Determination of semi-volatile organic compounds (SVOCs) by GC-MS. Water samples are extracted by LLE and soils using DCM/Acetone/Methanol.
ORG-022_PAH	Determination of semi-volatile organic compounds (SVOCs) by GC-MS. Water samples are extracted by LLE and solids using DCM/Acetone/Methanol. For PAHs:- Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. 1. 'TEQ 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. 'TEQ 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. 'TEQ 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. Note, for Total +ve calculations, the PQL is reflective of the lowest individual PQL and therefore, for example, "Total +ve PAHs" is simply a sum of the positive individual PAHs.
ORG-023_F1_TOT	Determination of volatile organic compounds (VOCs) by P&T-GC-MS. Water samples are analysed directly by purge and trap GC-MS. Solids are extracted with Methanol, diluted and analysed by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. 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.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

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.

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.

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.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

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.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

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 QAQC tables for details (available on request); <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; 60-140% for organics (+/-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 typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

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. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

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 or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary MFJ0016

Client Details

Client	Geo-Environmental Engineering Pty Ltd
Your Reference	E24017WB
Date Issued	04/10/2024

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	No	Duplicate Outliers Exist - See detailed list below
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary MFJ0016

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
vTRH&MBTEXN | Soil	1	26/09/2024	02/10/2024	04/10/2024	Yes
sTRH | Soil	1	26/09/2024	02/10/2024	02/10/2024	Yes
PAH | Soil	1	26/09/2024	02/10/2024	03/10/2024	Yes
OCP | Soil	1	26/09/2024	02/10/2024	03/10/2024	Yes
PCB | Soil	1	26/09/2024	02/10/2024	03/10/2024	Yes
Metals | Soil	1	26/09/2024	02/10/2024	02/10/2024	Yes
Metals-Hg | Soil	1	26/09/2024	02/10/2024	02/10/2024	Yes
Moisture | Soil	1	26/09/2024	02/10/2024	03/10/2024	Yes

Outliers: Duplicates

METALS-020|Acid Extractable Metals (Soil)| Batch BFJ0271

Sample ID	Duplicate ID	Analyte	% Limits	RPD
BFJ0271-DUP1#	DUP1	Lead	40.00	81.3[1]

Quality Control MFJ0016

ORG-023_F1_TOT|Volatile TRH and BTEX (Soil) | Batch BFJ0272

Analyte	Units	PQL	Blank	DUP1 BFJ0272-DUP1# Samp | QC | RPD %	LCS %	Spike % BFJ0272-MS2#
TRH C6-C9	mg/kg	25	<25	<25 | <25 | [NA]	85.2	64.8
TRH C6-C10	mg/kg	25	<25	<25 | <25 | [NA]	87.5	69.1
TRH C6-C10 less BTEX (F1)	mg/kg	25	<25	<25 | <25 | [NA]	[NA]	[NA]
Methyl tert butyl ether (MTBE)	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	[NA]	[NA]
Benzene	mg/kg	0.20	<0.20	<0.20 | <0.20 | [NA]	95.8	81.7
Toluene	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	104	88.8
Ethylbenzene	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	102	88.7
meta+para Xylene	mg/kg	2.0	<2.0	<2.0 | <2.0 | [NA]	114	98.7
ortho-Xylene	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	105	90.9
Total Xylene	mg/kg	3.0	<3.0	<3.0 | <3.0 | [NA]	[NA]	[NA]
Naphthalene (value used in F2 calc)	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	[NA]	[NA]
Surrogate aaa-Trifluorotoluene	*%*		*98.8*	*96.0 | 100*	*101*	*82.1*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

ORG-020|Semi-volatile TRH (Soil) | Batch BFJ0273

Analyte	Units	PQL	Blank	DUP1 BFJ0273-DUP1# Samp | QC | RPD %	DUP2 BFJ0273-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0273-MS1#
TRH C10-C14	mg/kg	50	<50	<50 | <50 | [NA]		123	91.3
TRH C15-C28	mg/kg	100	<100	<100 | <100 | [NA]		91.6	69.1
TRH C29-C36	mg/kg	100	<100	122 | 106 | [NA]		89.4	76.8
TRH >C10-C16	mg/kg	50	<50	<50 | <50 | [NA]		96.1	70.7
TRH >C16-C34 (F3)	mg/kg	100	<100	151 | <100 | [NA]		92.5	70.0
TRH >C34-C40 (F4)	mg/kg	100	<100	<100 | 148 | [NA]		84.7	84.7
Surrogate o-Terphenyl	*%*		*85.5*	*86.1 | 84.5*		*102*	*90.2*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

ORG-022_PAH|Polycyclic Aromatic Hydrocarbons (Soil) | Batch BFJ0273

Analyte	Units	PQL	Blank	DUP1 BFJ0273-DUP1# Samp | QC | RPD %	DUP2 BFJ0273-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0273-MS2#
Naphthalene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		101	99.9
Acenaphthylene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Acenaphthene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		98.3	101
Fluorene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		91.3	101
Phenanthrene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		83.9	97.6
Anthracene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Fluoranthene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		103	99.9
Pyrene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		110	103
Benzo(a)anthracene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Chrysene	mg/kg	0.10	<0.10	0.196 | <0.10 | [NA]		127	98.8
Benzo(b,j,k)fluoranthene	mg/kg	0.20	<0.20	<0.20 | <0.20 | [NA]		[NA]	[NA]
Benzo(a)pyrene	mg/kg	0.050	<0.050	0.125 | <0.050 | [NA]		98.5	97.5
Indeno(1,2,3-c,d)pyrene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Dibenzo(a,h)anthracene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Benzo(g,h,i)perylene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Surrogate p-Terphenyl-D14	*%*		*110*	*104 | 111*		*99.8*	*106*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

Quality Control MFJ0016

ORG-022_OC|Organochlorine Pesticides (Soil) | Batch BFJ0273

Analyte	Units	PQL	Blank	DUP1 BFJ0273-DUP1# Samp | QC | RPD %	DUP2 BFJ0273-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0273-MS2#
alpha-BHC	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		87.6	90.1
Hexachlorobenzene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
beta-BHC	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		89.9	94.4
gamma-BHC	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
delta-BHC	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Heptachlor	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		88.6	96.4
Aldrin	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		95.7	97.6
Heptachlor epoxide	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		88.1	91.1
trans-Chlordane	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
cis-Chlordane	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Endosulfan I	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
4,4'-DDE	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		96.6	97.8
Dieldrin	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		86.1	92.2
Endrin	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		76.0	88.6
4,4'-DDD	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		113	110
Endosulfan II	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Endrin aldehyde	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
4,4'-DDT	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Endosulfan sulfate	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		66.8	81.7
Endrin ketone	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Methoxychlor	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Mirex	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Surrogate 4-chloro-3-nitrobenzotrifluoride	*%*		*85.7*	*86.0 | 88.4*		*86.4*	*88.8*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

ORG-021/022/025_PCB|Polychlorinated Biphenyls (Soil) | Batch BFJ0273

Analyte	Units	PQL	Blank	DUP1 BFJ0273-DUP1# Samp | QC | RPD %	DUP2 BFJ0273-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0273-MS2#
Aroclor 1016	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1221	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1232	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1242	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1248	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1254	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1260	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
PCB C103	mg/kg			0.00 | 0.00 | [NA]		102	102
Surrogate 2-Fluorobiphenyl	*%*		*102*	*103 | 104*		*102*	*104*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

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METALS-020|Acid Extractable Metals (Soil) | Batch BFJ0271

Analyte	Units	PQL	Blank	DUP1 BFJ0271-DUP1# Samp | QC | RPD %	DUP2 BFJ0271-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0271-MS1#
Arsenic	mg/kg	4.0	<4.0	4.73 | 6.05 | [NA]		109	105
Cadmium	mg/kg	0.40	<0.40	<0.40 | <0.40 | [NA]		108	90.1
Chromium	mg/kg	1.0	<1.0	16.5 | 19.5 | 17.1		106	102
Copper	mg/kg	1.0	<1.0	15.2 | 16.8 | 10.2		109	110
Lead	mg/kg	1.0	<1.0	16.5 | 39.0 | 81.3 [1]		104	89.6
Mercury	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		97.6	93.6
Nickel	mg/kg	1.0	<1.0	7.01 | 7.28 | 3.87		106	93.5
Zinc	mg/kg	1.0	<1.0	39.9 | 54.5 | 30.8		115	89.2

Analyte	Units	PQL	Blank	DUP3 BFJ0271-DUP3# Samp | QC | RPD %	DUP4 BFJ0271-DUP4# Samp | QC | RPD %	LCS %
Arsenic	mg/kg	4		4.39 | <4.0 | [NA]		[NA]
Cadmium	mg/kg	0.4		<0.40 | <0.40 | [NA]		[NA]
Chromium	mg/kg	1		14.3 | 15.9 | 11.1		[NA]
Copper	mg/kg	1		16.8 | 15.8 | 6.15		[NA]
Lead	mg/kg	1		29.6 | 24.8 | 17.7		[NA]
Mercury	mg/kg	0.1		<0.10 | <0.10 | [NA]		[NA]
Nickel	mg/kg	1		9.94 | 10.9 | 9.34		[NA]
Zinc	mg/kg	1		126 | 107 | 15.8		[NA]

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-008|Inorganics - Moisture (Soil) | Batch BFJ0264

Analyte	Units	PQL	Blank	DUP1 BFJ0264-DUP1# Samp | QC | RPD %	DUP2 BFJ0264-DUP2# Samp | QC | RPD %	LCS %
Moisture	%	0.1		5.85 | 6.87 | 16.0	11.4 | 12.0 | 5.57	[NA]

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

QC Comments

Identifier	Description
[1]	Duplicate analysis precision is/are outside acceptable %RPD, re-analysis indicates possible sample heterogeneity.

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	Geo-Environmental Engineering Pty Ltd
Project Mgr:	Stephen McCormack
Sampler:	Stephen Mccormack
Address:	Unit 2, 5-7 Malta Street, Fairfield East
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au
Phone:	0458 550 257 (Sally) / 0431 480 980 (Stephen)

Client Project Name and Number: E24017WB

PO No.:

Envirolab Services Quote No. :

Date results required:

Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard**

Note: Inform lab in advance if urgent turnaround is required - surcharge applies

Envirolab Services
25 Research Dr, Croydon South VIC 3136

Phone: 02 9910 6200
Fax: 02 9910 6201

E-mail: ahie@envirolabservices.com.au

Contact: Aileen Hie / Simon Song

Sample information | **Tests Required** | **Comments**

Envirolab Sample ID	Client Sample ID	Date sampled	Type of sample	Combination 5a	Combination 5	Combination 3a	Combination 3	Metals Std 8	TRH (vol)/BTEXN	BTEXN	Asbestos ID	OCP/OPPs	Combination 1m					Hold	Provide as much information about the sample as you can
1	SG260924-101	26/09/2024	Soil		1														

Relinquished by (company):	Geo-Environmental Engineering
Print Name:	Sally Gartland
Date & Time:	26-Sep-24
Signature:	SG

Received by (company):	ELS MDL
Print Name:	JS
Date & Time:	1/10/24 1:30pm
Signature:	JS

Samples Received: Cool or Ambient (circle one)
Temperature Recieved at: 14°C (if applicable)
Transported by: Hand delivered / courier
Icepack Seal

Relinquished by: ELS SYD Shona Tolk 30/9/24 1125

MFJ0016

362821 2819 EW

APPENDIX G

95% UCL Calculation Worksheet

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	ProUCL 5.122/10/2024 5:11:59 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Bap TEQ

General Statistics

Total Number of Observations	14	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.5	Mean	1.414
Maximum	3.7	Median	1.2
SD	0.99	Std. Error of Mean	0.265
Coefficient of Variation	0.7	Skewness	1.257

Normal GOF Test

Shapiro Wilk Test Statistic	0.842	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.883	95% Adjusted-CLT UCL (Chen-1995)	1.944
		95% Modified-t UCL (Johnson-1978)	1.898

Gamma GOF Test

A-D Test Statistic	0.452	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.159	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.231	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.561	k star (bias corrected MLE)	2.06
Theta hat (MLE)	0.552	Theta star (bias corrected MLE)	0.687
nu hat (MLE)	71.71	nu star (bias corrected)	57.68
MLE Mean (bias corrected)	1.414	MLE Sd (bias corrected)	0.985
		Approximate Chi Square Value (0.05)	41.22
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	39.38

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.979	95% Adjusted Gamma UCL (use when n<50)	2.072

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.136	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.693	Mean of logged Data	0.139
Maximum of Logged Data	1.308	SD of logged Data	0.662

Assuming Lognormal Distribution

95% H-UCL	2.178	90% Chebyshev (MVUE) UCL	2.183
95% Chebyshev (MVUE) UCL	2.536	97.5% Chebyshev (MVUE) UCL	3.025
99% Chebyshev (MVUE) UCL	3.987		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.849	95% Jackknife UCL	1.883
95% Standard Bootstrap UCL	1.831	95% Bootstrap-t UCL	2.03
95% Hall's Bootstrap UCL	1.907	95% Percentile Bootstrap UCL	1.864
95% BCA Bootstrap UCL	1.936		
90% Chebyshev(Mean, Sd) UCL	2.208	95% Chebyshev(Mean, Sd) UCL	2.567
97.5% Chebyshev(Mean, Sd) UCL	3.066	99% Chebyshev(Mean, Sd) UCL	4.046

Suggested UCL to Use

95% Student's-t UCL	1.883		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.